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(71) Applicant: **FUJI PHOTO FILM CO., LTD.**
210 Nakanuma Minami Ashigara-shi
Kanagawa 250-01(JP)

(72) Inventor: **Terashita, Takaaki, c/o Fuji Photo Film Co., Ltd.**
798, Miyanodai, Kaisei-machi
Ashigara-kami-gun, Kanagawa(JP)
Inventor: **Kinjo, Naoto, c/o Fuji Photo Film Co., Ltd.**
798, Miyanodai, Kaisei-machi
Ashigara-kami-gun, Kanagawa(JP)
Inventor: **Kanafusa, Kunihiko, c/o Fuji Photo Film Co., Ltd.**
210 Nakanuma
Minami Ashigara-shi, Kanagawa(JP)
Inventor: **Ikenoue, Shinpei, c/o Fuji Photo Film Co., Ltd.**
210 Nakanuma
Minami Ashigara-shi, Kanagawa(JP)

(74) Representative: **Patentanwälte Grünecker, Kinkeldey, Stockmair & Partner**
Maximilianstrasse 58
W-8000 München 22 (DE)

(54) Method of making photographic prints.

(57) A method of making photographic prints wherein photographic data relating to photographic conditions of an original frame is recorded on a photographic print at the time of photographing the original frame, so as to determine the print exposure amount for printing the original frame. When it is determined with reference to the photographic data that a primary subject of the original frame has a proper density on the photographic film, the original frame is printed at a basic print exposure amount which is determined without using density data of the original frame. If it is determined with reference to the photographic data that the basic print exposure amount should be corrected for the original frame, an exposure correction amount is calculated based on the photographic data and/or the density data of the original frame. The photographic data is, for example, discrimination data for indicating whether the original frame has been photographed under a proper exposure control, or brightness values measured in a plurality of divisional areas. The photographic data may also be primary subject position data for deriving the density of the primary subject from the density data of the original frame.

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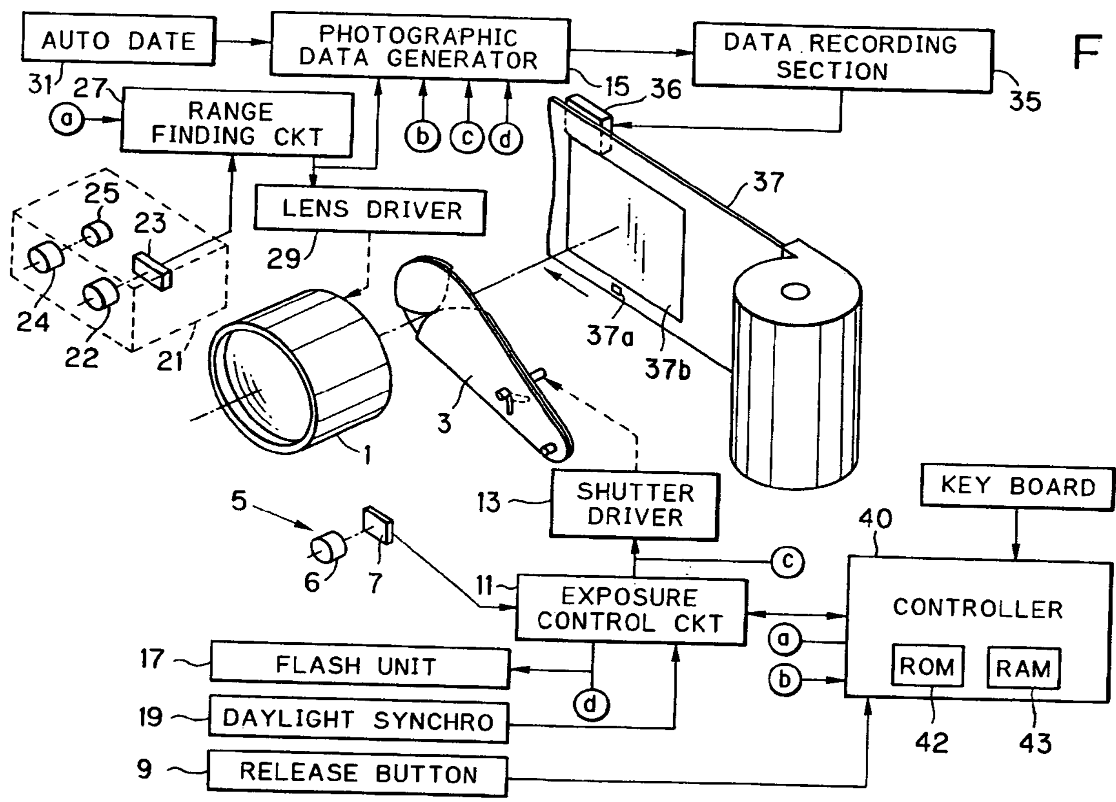

AUTO DATE
31
PHOTOGRAPHIC DATA GENERATOR
15
DATA RECORDING SECTION
35
36
27
RANGE FINDING CKT
b
c
d
a
37
LENS DRIVER
29
25
23
24
22
21
37a
37b
1
3
KEY BOARD
33
5
13
SHUTTER DRIVER
40
6
7
11
EXPOSURE CONTROL CKT
CONTROLLER
ROM
RAM
42
43
17
FLASH UNIT
19
DAYLIGHT SYNCHRO
9
RELEASE BUTTON

FIG. 1

Background of the Invention

1. Field of the Invention

The present invention relates to a photographic printing method and more particularly to a photographic printing method which determines a print exposure amount so as to make the print density of the primary subject optimum, by using photographic data recorded at a time of photographing.

2. Related Art

In making photographic print, it is conventional to determine first a basis print exposure amount based on an average density of each original frame recorded in photographic film, for example, LATD (Large Area Transmittance Density), and to calculate next an exposure correction amount on the basis of data about characteristics of each scene of the original frame, in order to determine a suitable print exposure amount. The suitable print exposure amount is determined by means of statistics in the conventional photographic printing method.

Although it is necessary to correct the print exposure amount when the density of a primary subject on the photographic film certainly differs from the average density of the whole area of the original frame including the primary subject, it is impossible in the above-described conventional photographic printing method to detect the primary subject density on the photographic film precisely, because the position of the primary subject within the original frame is not mechanically discriminative.

Therefore, it is hard to execute a proper correction of the print exposure amount. Especially when the primary subject is disposed out of a central area of the original frame, it is still more difficult to presume the primary subject density on the photographic film, and hence the precision of the correction is lowered.

Furthermore, even when the original frames have been taken under a high-precision exposure control of a camera, such a high-precision exposure control scarcely have influence on the conventional print exposure determination. As a result, there is almost no difference in quality between the photographic prints made from original frames taken by low-performance cameras, on one hand, and the photographic prints made from original frames taken by high-performance cameras.

Meanwhile, because recent cameras have a high-precision automatic exposure control system by which images of the subjects can automatically be photographed at a proper exposure value. For example, the exposure value of the camera is automatically determined in accordance with the brightness of a primary subject which is selected automatically or by manually focusing on the primary subject. Therefore, it should be possible to make proper prints from the original frames taken by such a high-precision camera, while printing at a constant print exposure amount, for example, for a constant print exposure time, which is predetermined according to the type of photographic paper and the print magnification, without measuring the density of each original frame for determining the respective print exposure amount.

However, if all the original frames should be printed at a constant exposure time, photographic prints of some scenes which is beyond the faculty of the automatic exposure control of the camera, would contain improperly finished images of primary subjects. Such a case would arise, for example, when the density of the primary subject on the photographic film is certainly different from the average density of the original frame, as is described above.

Summary of the Invention

In view of the foregoing, an object of the present invention is to provide a photographic printing method by which the photographic print is finished so as to make the print density of the primary subject optimum.

Another object of the invention is to provide a photographic printing method which prevents the quality of the photographic prints from being affected by the faculty of the exposure control of the cameras.

To achieve the above and other objects, a method of making photographic prints of the present invention measures brightness values of a subject distinctively in a primary subject area and a background area, and controls an exposure value based on these brightness values, especially on the brightness value of the primary subject area, so as to make the density of a primary subject disposed in the primary subject area of the original frame optimum. At the time of photographing a frame of the subject, photographic data relating to photographic conditions of the frame is recorded on a photographic print. When it is determined with reference to the photographic data that a primary subject of the original frame has a proper density, the frame is printed at a basic print exposure amount which is determined without using density data of the frame. If it is determined with reference to the photographic data that the basic print exposure amount should be corrected for the frame, an exposure correction amount is calculated based on the photographic data and/or the density data of the frame.

According to an embodiment of the invention, the photographic data is discrimination data for indicating whether the frame has been photographed under a proper exposure control. If the discrimination data indicates that the frame is a properly exposed frame, the frame is printed at a basic print exposure amount which is determined for a properly exposed standard image and changed, for example, according to the film type.

According to another embodiment, a coordinate relating to at least two parameters is used for determining whether the frame is photographed under a photographic condition which can be dealt with the automatic exposure control of the camera, and the parameters are derived from the photographic data. The coordinate is sectioned into several correction ranges, to each of which an equation for calculating an exposure correction amount is allocated. The parameters are also used as the factors of the equation. In this embodiment, the photographic data is, for example, brightness values measured in the primary subject area and the background area.

According to a further embodiment, the photographic data is primary subject position data for deriving the density of the primary subject within the original frame from the density data of the original frame which is measured, for example, by three color separation of each pixel of the frame.

As described above, the present invention determines the print exposure amount with reference to the photographic data relating to the photographic condition, especially to the exposure condition of the image of the primary subject and, if necessary, a print exposure correction amount is determined based on the photographic data in combination with the density data of the original frame. Therefore, it becomes possible to make the print density of the primary subject optimum, compared with the conventional printing methods wherein only the density data of the original frame is used for determining the print exposure amount.

Brief Description of the Drawings

Other objects and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments when read in connection with the accompanying drawings, wherein like reference numerals designates like or corresponding parts throughout the several views, and wherein:

Figure 1 schematically shows a camera having photographic data recording function, for use in a first embodiment of the invention;

Figure 2 is an explanatory view of an image area sensor for brightness measurement of the camera shown in Fig.1;

Figure 3 shows an example of photographic film having the photographic data recorded thereon;

Figure 4 schematically shows a photographic printer for use in the first embodiment of the invention;

Figure 5 is a flow chart illustrating the procedure of making photographic prints according to the first embodiment of the invention;

Figure 6 is a coordinate for use in calculating a print exposure correction amount based on the central area brightness data and the peripheral area brightness data;

Figure 7 is a coordinate for use in calculating a print exposure correction amount based on the camera magnification data and the peripheral area brightness data;

Figure 8 schematically shows a camera having discrimination data recording function;

Figure 9 is an explanatory view of an image area sensor for brightness measurement of the camera shown in Fig.8;

Figure 10 schematically shows a photographic printer for use in combination with the camera of Fig.8;

Figure 11 is a flow chart illustrating the procedure of making photographic prints according to the embodiment of Figs.8 to 10;

Figure 12 schematically shows a camera having primary subject position data recording function;

Figure 13 is an explanatory view of divisional areas of the camera shown in Fig.12;

Figure 14 is an explanatory view of an LCD panel disposed in a viewfinder of the camera of Fig.12;

Figure 15 schematically shows a photographic printer for use in combination with the camera of Fig.12; and

Figure 16 is a flow chart illustrating the procedure of making photographic prints according to the embodiment shown in Figs. 12 to 15.

Detailed Description of the Preferred Embodiment

Fig.1 show a camera which record photographic data, wherein a shutter mechanism 3 is disposed at the back of a taking lens 1. A brightness measurement unit 5 is constructed by a lens 6 and an image area sensor 7, and measures the subject brightness values (BV) of a plurality of divisional areas.

The image area sensor 7 is divided into a central area 7a and peripheral areas 7b to 7c surrounding the central area 7a, as shown in Fig.2. Data of the subject brightness value of the respective area 7a to 7e are sent to an exposure control circuit 11. The exposure control circuit 11 calculates a light value (LV) based on these subject

brightness data, but specially on the subject brightness value of the central area and film speed data, and program-controls the shutter mechanism 3 depending on the light value through a shutter driver 13. The exposure control circuit 11 also sends the subject brightness data of the respective areas 7a to 7e to a photographic data generator 15.

The exposure control circuit 11 includes a conventional subject brightness discrimination circuit for automatically activating a flash unit 17 in synchronism with the shutter mechanism 3 when the subject brightness is in a low level. There is further a daylight-synchro switch 19 for activating the flash mechanism 17 even when the subject brightness is in a high level if the daylight-synchro switch 19 is turned on. A flash signal and a daylight synchro flash signal from the exposure control circuit 11 are also sent to the photographic data generator 15.

A range finding sensor unit 21 includes a light receiving section constructed by a lens 22 and a line sensor 23, and a light projecting section constructed by a lens 24 and a light source, for example, a light emission diode (LED) 25. During the range finding operation which is effected by half-depressing the release button 9, a near infrared spot light is projected from the light projecting section toward a primary subject, and the light reflected from the primary subject becomes incident on the line sensor 23. the output signal from the line sensor 23 is sent to a range finding circuit 27 which checks on what position of the line sensor 23 the reflected light was incident, thereby detecting the distance from the camera to the primary subject. Data of the subject distance is sent to a lens setting driver 29 which upon full depression of the release button 9, sets the taking lens 1 at a position corresponding to the subject distance. The subject distance data outputted from the range finding circuit 27 also is sent to the photographic data generator 15.

The photographic data generator 15 also receives photographing time data and other data from an auto-date (automatic date recording) unit 31. Codes or symbols indicating the kind of photographic scenes, which are entered through a keyboard 33, are sent to the photographic data generator 15. The photographic data generator 15 codes the respective photographic data, and sends the photographic data codes to a data recording section 35. The data recording section 35 drives an LED 36 so as optically to record the photographic data in the form of a digital code in a blank margin of an original image frame.

A controller 40, which is constructed by a conventional micro computer, sequentially controls respective sections of the camera in accordance with a program stored in a ROM 42 incorporated in the controller 40. The controller 40 includes a RAM 43, in which the photographic data from the photographic data generator 24 is stored, and from which the photographic data may be transferred to an external memory, such as a memory card, or the like.

Fig.3 shows an example of a photographic film with the distance information recorded thereon. This photographic film 37 is formed with perforations 37a at a constant pitch. The perforations 37a are detected by a sensor of a feed stop device (not shown) so as to control feeding the film by one frame at a time. The original frames 37b are recorded on a photosensitive emulsion surface of the photographic film 37 in association with the respective perforations 37a. The digital code is recorded on a side of the original frame 37b opposite the perforation 37a in the form of a bar code 38.

Fig.4 illustrates a photographic printer, in which a white light radiated from a light source 45 passes through a cyan filter 46, a magenta filter 47, and a yellow filter 48, and enters a mixing box 49. These color correction filters 46 to 48 are fixed in a predetermined position for printing ordinary original frames. When the operator enters a correction value through a keyboard 50 for an original frame which needs special correction, the degree of insertion of these color correction filters 46 to 48 into an optical path 52 is controlled by a filter controller 51 in accordance with the entered correction value, so that three color components and intensities of printing light are regulated. The mixing box 49 is constructed of a rectangular tube having an inner mirror surface and diffusion plates mounted on both opposite ends of the rectangular tube.

A film carrier 55 is set at the printing stage. A developed photographic film 37 is set in the film carrier 55, and is illuminated with light transmitted through the mixing box 49. The light transmitted through an original frame of the photographic film 37 is focused by a printing lens 57 onto a photosensitive emulsion surface of photographic paper 58 while a shutter 56 is opened, so that an image of the original frame is printed on the photographic paper 58. The shutter 56 is driven by a shutter driver 60 to open for an appropriate time period. The film carrier 55 is provided with a film mask 61 which is mounted at the printing stage, for ensuring the evenness of the photographic film 37. The film mask 61 is formed with an opening corresponding to the size of a frame as well known in the art. The film mask 61 is raised up by a solenoid (not shown) while the photographic film 37 is being fed, and then is lowered to press the photographic film 37 during the printing operation.

A bar code reader 65 is mounted at the upstream portion of the printing stage to read the bar code 38 recorded for the original frame while the photographic film 37 is fed to the printing stage.

The read bar code 38 is decoded by a decoder 66 into photographic data signal usable in the photographic printer and, thereafter, is sent to a controller 67 of the photographic printer.

The controller 67, which is constructed by a conventional micro computer, calculates a print exposure correction amount based on the central area brightness data and the peripheral area brightness data of the photographic data read from the photographic film 37, and calculates a proper print exposure amount based on a basic print exposure amount and the exposure correction amount. The controller 67 controls the shutter driver 60 so as to open the shutter 57 for a given time that is determined according to the proper print exposure amount. It is possible to predetermine a basic print exposure time corresponding to the basic print exposure amount, and determine a proper print exposure time by adding a correction time, which is calculated based on the print exposure correction amount, to the basic print exposure time. A display 68 is connected to the controller 67, for displaying data entered through the keyboard 50 and/or read from the photographic film 37.

Fig.5 illustrates a routine for making photographic prints according to the above-described embodiment. First, the camera performs a divided brightness measurement in the central area 7a and the peripheral areas 7b to 7e, and makes a photograph under an exposure control which uses the brightness values measured in these divisional areas, but puts emphasis on the central area brightness. Simultaneously with the photographing, both of the central and peripheral area brightness data are recorded on the photosensitive emulsion surface of the photographic film in the form of a bar code 38. It is to be noted that when the release button 9 is half-depressed while framing the primary subject in the central area of the view field, the focus is locked at the primary subject, and the exposure is also locked at this condition. Therefore, the photographer can move the camera thereafter, so as to change the position of the primary subject within the viewfinder while depressing the release button halfway. When the release button 9 is fully depressed, an exposure is made.

After exposing an entire area of a strip of photographic film 37, the photographic film 37 is forwarded to a photofinishing laboratory, wherein developing and printing of the photographic film 37 is performed. In printing, the bar code reader 65 reads the bar code 38 recorded on the photographic film 37. The decoder 66 converts the bar code signal into the central area brightness data and the peripheral area brightness data, and sends these data to the controller 67. The controller 67 calculates a print exposure correction amount based on the central area brightness data and the peripheral area brightness data.

According to an embodiment, central area brightness data and peripheral area brightness data included in the photographic data are used as the parameters for the print exposure correction. First, it is determined which correction range the scene of the original frame belongs to, with reference to the coordinate shown in Fig.6. The coordinate of Fig.6 shows a relationship between the central area brightness and the peripheral area brightness, the vertical axis of which represents the central area brightness, and the horizontal axis of which represents the peripheral area brightness. The coordinative plane is sectioned into three ranges R1 to R3, to each of which a correcting direction and a group of parameters for the print exposure correction are allocated.

The range R1 corresponds to scenes wherein the central area brightness is less than a predetermined value α. For such scenes, a proper exposure control can be automatically effected by the camera, so that the images of the primary subjects in the original frames mostly have a proper density. Therefore, the basic print exposure amount is not corrected for the scenes that belong to the range R1.

The range R2 corresponds to scenes wherein the central area brightness is equal or more than the predetermined value α and the peripheral area brightness is equal or more than a predetermined value β. These scenes tend to be rear-lighted photographs. Because the divided brightness measurement system in the camera detects the brightness values of all divisional areas, and uses these brightness values for the exposure control, the central area, that is mostly the primary subject area, tends to be under-exposed in the rear-lighted photograph due to the relatively high brightness of the peripheral area, that is, the back ground brightness. In such a case, the negative image of the primary subject tends to be a low density level, so that the print density of the primary subject in the photographic print would be improperly high if the photographic print is made by using a print exposure time that is determined based on the basic print exposure amount. For this reason, when the scenes belong to the range R2, a minus correction is performed in printing so as to obtain a proper print density of the primary subject.

It is to be noted that it is general in the above-described divided brightness measurement system to weight the peripheral area brightness with a factor less than 1 while the central area brightness is weighted with a factor 1.

The range R3 corresponds to scenes wherein the central area brightness is equal or more than the predetermined value α and the peripheral area brightness is less than the predetermined value β.

These scenes tend to be front-lighted photographs. For the same reason as above, the central area tends to be over-exposed in the front-lighted photograph due to the relatively low brightness of the peripheral area. In such a case, the negative image of the primary subject tends to be a high density level, so that the print density of the primary subject of the photographic print would be improperly low if the photographic print is made by using a print exposure time that is determined based on the basic print exposure amount. Therefore, the scenes belonging to the range R3 is subjected to a plus correction in printing so as to obtain a proper print density of the primary subject.

Specifically, the print exposure correction amount Y for the basic print exposure amount X is calculated according to the following equation:

$$Y = a1 \cdot Z1 + a2 \cdot Z2 + a3 \cdot Z3 + a4 \cdot Z4 + a5 \cdot Z5$$

wherein a1 to a5 are factors predetermined by means of statistics and have different values for each range R1, R2, R3, R4, R5; and Z1 to Z5 are brightness values detected from the divisional measurement areas 7a to 7e, respectively.

The basic print exposure amount X is corrected by the print exposure correction amount Y, thereby obtaining a proper print exposure amount E (= X + Y). Then a print exposure time is calculated based on the proper print exposure amount E, and the shutter driver 60 is controlled according to the print exposure time.

According to another embodiment, the peripheral area brightness and the camera magnification data are used as the parameter for determining the print exposure correction amount. In this embodiment, a two-dimentional coordinate as shown in Fig.7 is used, the vertical axis of which represents the peripheral area brightness, and the horizontal axis of which represents the camera magnification. The coordinative plane of this coordinate is sectioned into six ranges B1 to B6, and a specific print exposure correction is effected individually for each range.

The range B1 corresponds to those scenes wherein the peripheral area brightness is high and the camera magnification is in a low level. Such scenes include, for example, a far distant landscape. Because the scene belonging to the range B1 tends to have an over-exposed primary subject, a plus correction is executed in printing. The range B2 corresponds to those scenes wherein the peripheral area brightness is high and the camera magnification is in a middle level. Such scenes include, for example, a near landscape. Because the scene belonging to the range B2 tends to have an under-exposed primary subject, a minus correction is executed in printing. The range B3 corresponds to those scenes wherein the peripheral area brightness is high and the camera magnification is in a high level. Such scenes include, for example, a landscape photograph taken at a high telephoto ratio. Because the scene belonging to the range B3 tends to have an over-exposed primary subject, a plus correction is executed in printing. The range B4 corresponds to those scenes wherein the peripheral area brightness is low and the camera magnification is in a low level. Such scene include, for example, a far distant landscape. Because the scene belonging to the range B4 tends to have an under-exposed primary subject, a minus correction is executed in printing. The ranges B5 and B6 corresponds to those scenes wherein the peripheral area brightness is high and the camera magnification is in a low level. Such scenes include, for example, a close-up photograph. Because the scenes belonging to these ranges B5 and B6 are scarcely affected by the peripheral area brightness, and are photographed at an optimum exposure determined mainly on the basis of the central area brightness, there is no need for print exposure correction.

Although the above-described embodiments use the central area brightness in combination with the peripheral area brightness, or the peripheral area brightness in combination with the camera magnification, as parameters for determining whether and how the print exposure correction should be performed, it is possible to use other photographic data obtained in the camera side, for example, the difference between the central and the peripheral area brightness in combination with the camera magnification.

It is also possible to use density data obtained from the original frame recorded on the photographic film, such as the average density, divisional area density and density distribution of the original frame. Furthermore, it is possible to use the photographic data obtained in the camera side in combination with the density data of the original frame.

The parameters for calculating the exposure correction amount are not limited to the above described embodiments, but the density data of the original frame and/or other data may be used instead.

Although the above described embodiment makes use of the subject distance data as the camera magnification data, other data may be used as the camera magnification data if only the size of the primary subject within the original frame can be estimated from that data. For example, data of the focal length of the taking lens may be used as the camera magnification data.

The two-dimensional coordinate for discriminating the necessity and direction of the print expo-

sure correction may be replaced by a three-dimensional coordinate which, for example, represents the relationship between the central area brightness and the peripheral area brightness and the camera magnification.

It is also possible to use these parameter in calculating the exposure correction amount.

In the above described embodiments, those original frames which need the print exposure correction in order to obtain a proper print density of the primary subject, can be sorted out in the printing process by using a coordinate of photographic parameters, with reference to the photographic data of each original frame recorded on the photographic film during photographing. Therefore, it may be possible to feed back the result of sorting to the automatic exposure control of the camera by some way. Thereby, precision of the exposure control of the camera will be improved.

Figs.8 to 11 shows a third embodiment of the invention wherein discrimination data are recorded on the photographic film for discriminating between those original frames which are judged to be properly exposed under the automatic exposure control of the camera, and those original frames which contain such scenes that cannot be properly exposed under the automatic exposure control of the camera, such as, a rear-lighted scene. The print exposure correction is effected with reference to the discrimination data.

Fig.8 shows a camera which records discrimination data for selecting a printing sequence. The camera has a conventional range finding unit 21 disposed on the front of the camera body (not shown). When a release button 9 is depressed halfway, an LED 25 is caused to emit light so as to project near infrared spot light toward a primary subject 16 through a lens 24. The light reflected from the primary subject 16 becomes incident on a line sensor 23 through a lens 22. A range finding circuit 27 detects a subject distance depending on the incident position on the line sensor 23, and sends the subject distance data to a lens driver 29.

An aperture mechanism 2 and a shutter mechanism 3 are disposed at the back of a taking lens 1. A brightness measurement section 5' is constructed by a lens 6 and an image sensor 8, and measures subject brightness values (BV) upon half-depression of a release button 9.

The image area sensor 8 has divisional areas A1 to A35 arranged in a 7 x 5 matrix, as shown in Fig.9, wherein brightness measurement spots SP1 to SP9 are disposed at the respective centers of the central areas A10 to A12, A17 to A19 and A24 to A26 of these divisional areas A1 to A35. When photographing, the release button 9 is depressed halfway while the primary subject 16 is placed in the central areas, as shown in Fig.9, so as to effect a focus-lock condition. The subject brightness values detected at the brightness measurement spots SP1 to SP9 are sent to an exposure control circuit 11 during the focus-lock condition.

The exposure control circuit 11 calculates a light value (LV) based on the respective subject brightness values and data of the film speed, and program-controls an aperture driver 18 and a shutter driver 13 according to the light value. The exposure control circuit 11 is also connected to a discrimination data generator 30. The discrimination data generator 30 outputs a discrimination signal to a data recording section 35, for discriminating whether the exposure control circuit 11 can properly perform an exposure control based on the primary subject brightness. That is, the discrimination signal indicating that the exposure control of the camera is improper is outputted when the light value for controlling the aperture driver 18 and the shutter driver 13 is out of a range dealt with the program control, or when it is determined that the photographic scene is under a condition where proper brightness measurement is impossible.

Concretely, the cases where the camera cannot precisely perform the exposure in accordance with the command from the exposure control circuit 27, include lack or excess of flash light amount. The lack of flash light will arise when a quotient obtained by division of the guide number by the subject distance is larger than a maximum aperture size or the aperture size determined by the exposure control circuit 11. For example, when making a flash photograph of a subject disposed in a relatively far range, or a night landscape photograph, such a lack of flash light may occur.

The excess of flash light may arise when, for example, making a flash photograph of a primary subject which is disposed in a near range but is out of the center of the photographic field. At that time, it is possible that a low level background brightness is measured, and the exposure determination is affected by the low brightness level.

The condition where proper brightness measurement is impossible may arise, for example, when the size of the brightness measurement spot of the image area sensor 8 is certainly larger than (e.g. factor 2) than the size of an image of the primary subject formed on the image area sensor 8. Also when the size of the brightness measurement spot of the image area sensor is not so larger than the size of an image of the primary subject on the image area sensor 8, e.g. less than factor 2, and that, the brightness difference in the photographic field is large (e.g. more than 8 EV), a proper brightness measurement is impossible. This is because there is a good possibility in this case that the exposure determination is certainly affected by the background.

When the release button 9 is further depressed to the full, a controller 41 outputs an exposure start signal to the lens driver 29. Then, the lens driver 29 moves the taking lens 1 for focusing according to the subject distance data. The controller 41 sends a signal for actuating the aperture driver 18 and the shutter driver 13 after completing the focusing of the taking lens 1. Thereby, the aperture 2 is adjusted to the subject brightness and, thereafter, the shutter 3 is opened for a given time, so as to take an image of the subject on the photographic film 37 through the taking lens 1.

A data recording section 35 drives an LED 36 concurrently with the shutter release, so as to record the discrimination data on an area outside the corresponding original frame 37b of the photographic film 37, for example, in the form of a bar code 38, as shown in Fig.3.

Fig.10 shows a photographic printer for use in the third embodiment of the present invention, wherein like or corresponding parts are designated by the same reference numerals as Fig.4, and the description thereof is omitted for brevity. A controller 67 is constructed by a conventional microcomputer, and sequentially controls the respective parts of the photographic printer according to a program stored in a ROM which is incorporated in the microcomputer. Two exposure calculators 70 and 71 are connected to the controller 67, so as to alternatively use the first and second exposure calculators 70 and 71 depending on the discrimination data 38 recorded for the original frame.

The first exposure calculator 70 is selected for the original frame with such discrimination data that indicates the original frame taken under an exposure value determined by putting emphasis on the brightness data of the primary subject. The first exposure calculator 70 calculates an exposure amount by correcting a predetermined constant print exposure amount according to the film speed, without using the density data of the original frame. This is because the photographic films have different film speeds according to the type or maker thereof, even through the films are sold as having the same film speed. For example, a type of photographic film produced as ISO 100-type film by a film maker actually has a film speed ISO 120 in the strict meaning, while a type of photographic film produced as ISO 100-type film by another maker actually has a film speed ISO 70. Therefore, even when the camera has properly controlled the exposure on the basis that the film speed ISO 100, the density of the original image of the primary subject would differ from each other according to the film type. For this reason, it is necessary to correct the print exposure amount based on the film type.

The first exposure calculator 70 uses the following equation 1 for calculating the print exposure amount, which simplifies the principle of correction:

$$\log Ej = Km\,(Bkj) + Bnj + Kj \qquad (1)$$

wherein

- Ej: print exposure amount;
- Km: exposure correction coefficient determined based on the print magnification;
- Bkj: predetermined constant print exposure amount;
- Bnj: exposure correction amount determined based on the film speed which is different according to the film type;
- Kj: exposure correction amount determined based on the sensitivities of printing lens system and photographic paper, and the characteristic related to development;
- j: one of the three primary colors R, G and B.

The second exposure calculator 71 is selected for the original frame with such discrimination data that indicates the original frame taken under an improper exposure value, and calculates a print exposure amount in a conventional manner. The second exposure calculator 71 is connected to a characteristic value deriver 73 for calculating characteristic values based on light measurement data detected by a scanner 72 from the original frame. The scanner 72, which is constructed by a lens and an image area sensor, is disposed in a position facing to the original frame set in a film carrier 55. The scanner 72 measures the pixels of the original frame to be printed in the three color separation method, and sends the light measurement data to the characteristic value deriver 73. The characteristic value deriver 73 calculates an LATD value, a maximum density, a minimum density, and the like, and sends these values to the second exposure calculator 71. The second exposure calculator 71 calculates a print exposure amount based on the characteristic values according to the following equation 2:

$$\log Ej = Km \cdot Cj\,(Dj - Dnj) + Bnj + Kj \qquad (2)$$

wherein

- Cj: a slope value serves as a coefficient for adjusting the density and color balance of the print image according to the density of the image of the original frame
- Dj: LATD value of the original frame
- Dnj: LATD value of a normal film (standard LATD value)

It is to be noted that a high-light density or another density of the image of the original frame may be used as factors Dj and Dnj, instead of the LATD value, wherein the high-light density is detected by

eliminating the shadow portions of the image.

Although two kinds of discrimination data are recorded in the above-described embodiment, that is, one for properly exposed original frame and the other for improperly exposed original frame, it is, of course, possible to record the discrimination data only for those original frames which were taken properly by the automatic exposure control of the camera. It is also possible to record the discrimination data only for those original frames which were not able to be properly exposed by the automatic exposure control of the camera.

Fig.11 shows a procedure of making photographic prints in the photographic printer of Fig.10 in combination with the camera of Fig.8, on the premise that the discrimination data 38 is recorded only for those original frames which have been taken under a proper exposure condition.

First, when the release button 9 is depressed halfway while aiming the camera at a subject, a focus-lock condition is provided. Simultaneously, an automatic exposure control is performed based on the brightness values of the focus-locked subject which are detected at the brightness measurement spots SP1 to SP9. Thereafter, the camera can be moved for reframing the subject. When the release button 9 is further depressed to the full, the aperture 2 and the shutter mechanism 3 are program-controlled, so as to expose the photographic film 37 in an amount according to the subject brightness of the focus-locked subject. Furthermore, the discrimination data is recorded as the bar code 38 on the photosensitive emulsion surface of the photographic film 37 in a position corresponding to the related original frame, for indicating that this original frame was taken under a proper exposure condition. No discrimination data is recorded for such an original frame which was taken under an improper exposure condition.

After completing the exposure of a strip of photographic film 37, the exposed photographic film 37 is forwarded to a photofinishing laboratory, wherein the photographic film 37 is subjected to development and printing. In printing, a bar code reader 65 reads the bar code 38 recorded on the photographic film 37. A decoder 66 converts the bar code signal into the discrimination data, and sends the discrimination data to the controller 67.

The controller 67 selects either the first or the second exposure calculator 70 or 71 with reference to the discrimination data. Namely, the first exposure calculator 70 is selected for the original frame with the discrimination data. Based on the print exposure amount calculated in the first exposure calculator 70, the controller 67 controls the printing. Because a constant value is predetermined as the print exposure amount for each film type, that is, according to the actual film speed of the photographic film, in the first exposure calculator 70, a timer is used for printing so as to provide the constant print exposure time. In this timer print, color correction filters 46 to 48 are inserted into the print light path by respectively predetermined amounts, each of which corresponds to an exposure amount of each color determined depending on the color sensitivity of each type of film. The color corrected light is projected for a constant time predetermined for each filter type.

In place of the just-described printing method, it is possible to first project print light without inserting any color correction filters 46 to 48 in the light path and, thereafter, sequentially insert the color filters so as to cut out the color components of the print light when the exposure amount of that color reaches the above-described predetermined amount.

The controller 67 selects the second exposure calculator 71 for the original frame with no discrimination data. In this case, the scanner 72 is activated to measure the three color densities of each pixel of the original frame to be printed, and sends the three color densities to the characteristic value deriver 73. The characteristic value deriver 73 calculates the LATD value and other characteristic values of the original frame, and sends them to the second exposure calculator 71. The second exposure calculator 71 calculates a print exposure amount according to the equation 2, and sends the calculated amount to the controller 67. The controller 67 calculates the respective filter set values based on the print exposure amount, and controls a filter controller 51 so as to adjust the color balance and color intensities of the print light in accordance with the filter set values.

Although the first exposure calculator uses the equation 1 in the above-described embodiment, it is possible to use the following equation 3 for a more precise exposure control, wherein an exposure correction amount Blj that is determined according to the light source type for photographing and an exposure correction amount Bcj which is determined according to the camera type are considered in addition to the factors of the equation 1:

$$\log Ej = Km (Bkj) + Bnj + Blj + Bcj + Kj \quad (3)$$

The discrimination data may be recorded in the other form than the bar code. For example, optical marks or magnetic marks may be recorded as the discrimination data.

Furthermore, the discrimination data may be manually entered through a keyboard or the like, instead of the above-described automatic recording. In this case, it is preferable to record the discrimination data for the original frames which are desired to be printed by using the first expo-

sure calculator 70. In this way, it is possible to print the original frame taking the photographic condition into consideration, so as to obtain a photographic print which reflects the intention of the photographer.

Fig.12 shows a camera which records primary area data, wherein like or corresponding parts are designated by the same reference numerals as the above-described embodiments, and the following description thereof only relates to the essential parts of this embodiment. A light projecting section includes a lens 24 and a light source 25 for projecting near infrared spot light toward a subject. According to the embodiment of Fig.12, the photographic frame of the camera is divided into a plurality of areas A1 to A35 arranged in a 7 x 5 matrix, and distance measurement points DP1 to DP15 are disposed at the centers of the central areas A9 to A13, A16 to A20 and A23 to A27 of these divisional areas A1 to A35, as shown in Fig.13.

When a release button 9 is depressed halfway, a controller 80 controls the light source 25 and a two-dimensional scanner 81 such that the light source 25 emits the spot light intermittently and that the two-dimensional scanner 81 drives the light projecting section so as to scan a photographic scene 10 by the spot light. As a result, the spot light sequentially illuminates the distance measurement points DP1 to DP15 of the photographic scene 10. The light projected intermittently toward a subject 16 and thus reflected from the subject 16 becomes incident on an incident position detector, for example an image area sensor 90, through a lens 22.

The controller 80 has a pulse counter for counting drive pulse applied to the two-dimensional scanner 81 so as to detect the scanning position of the light projecting section with respect to the photographic scene 10, that is, the scanning position within the frame. The scanning position signal is sent to a position-distance detector 82. The position-distance detector 82 also receives an output signal from the image area sensor 90, and determines the presence or absence of the subject 16 depending on whether the image area sensor 90 receives the reflected light. The position-distance detector 82 detects the incident position of the reflected light on the image area sensor 90 based on a time sequential signal from the image area sensor 90, and detects the position and the distance of the subject 16 based on the relationship between the incident position and the scanning position in the frame. It is possible to continuously activates the light source 25 so as to scan the photographic scene 10 linearly line by line.

When there are a plurality of subjects in the photographic scene 10, the position and the distance of each subject are detected. A selection circuit 83 determines a primary subject on the basis of the position data and the distance data of the plurality of subjects. According to this embodiment, the subject disposed at the nearest range of all the subjects is first selected as the primary subject. It is to be noted that it is also general to select the subject disposed at a position nearest to the center of the photographic scene 10 as the primary subject.

The selection circuit 83 outputs a primary area signal representing the areas of the divisional areas A1 to A35 which contain the selected primary subject. The primary area signal is sent to a lens driver 29, an exposure control circuit 11, a primary area data generator 84, and a finder display section 85.

The finder display section 85 is constructed by a transparent LCD panel 87 disposed in a viewfinder 86, and an LCD driver 88. The LCD panel 87 is divided into segments arranged in a 7 x 5 matrix, correspondingly to the divisional areas A1 to A35, as shown in Fig.14. The segments which correspond to the primary area designated by the primary area signal from the selection circuit 83, for example, the areas A12, A19, A20, A26 and A27, are driven to slightly increase the density of these segments compared with the other display segments, as shown by hatched area. Because the subject can be viewed through the segments in this semitransparent condition, it is possible to visually confirm whether the selected primary area actually contains the primary subject intended by the photographer. As shown, when the selected primary subject extends over several divisional areas, all the corresponding segments are driven to be semitransparent.

If there are several subjects in the photographic scene 10, the selection circuit 27 first drives the LCD panel 87 to make those segments which correspond to the divisional areas containing the nearest subject semitransparent in an intermittent fashion. If the primary subject is in the intermittently driven segments, the photographer can depress the release button 9 to the full, thereby executing an exposure. If the primary subject is not in these segments, the photographer depresses a primary area selection button 89. Then, the selection circuit 83 outputs a primary area signal of the second nearest subject to the LCD driver 88. Thereby, the LCD panel 87 displays these segments which correspond to the secondary selected primary area to be semitransparent intermittently. If the primary subject is contained in the secondary selected segments, the release button 9 is depressed to execute an exposure. If the primary subject is not contained in these segments, the primary area selection button 89 is depressed again to display the third primary area, and so on.

A light measurement section 5" is constructed by a lens 6 and an image area sensor 8' for brightness measurement. The image area sensor 8' is also divided into a plurality of brightness measurement areas arranged in a 5 x 7 matrix, as shown in Fig.13. However, the number of brightness measurement areas may be changed. When the release button 9 is depressed halfway, the image area sensor 8' measures the subject brightness values (BV) of the respective brightness measurement areas A1 to A35. The subject brightness values are sent to the exposure control circuit 11. Because the exposure control circuit 11 also receives the primary area signal from the selection circuit 27, the exposure control circuit 11 calculates a light value (LV) based on the subject brightness data of those brightness measurement areas which contain the primary subject in combination with film speed data, and program-controls the aperture driver 18 and the shutter driver 13. The exposure controller 11 may control a flash unit (not shown) to flash automatically in synchronism with the shutter release operation.

The primary area data generator 84 codes the primary area signal, and sends the code data to a data recording section 35. The data recording section 35 drives an LED 36 to record the primary area data in a blank outside a corresponding original frame 37b on photographic film 37 in the form of a digital code, for example, a bar code 38 as shown in Fig.3.

Fig.15 shows a photographic printer for use in combination with the camera of Fig.12, wherein like or corresponding parts are designated by the same reference numerals as the above-described embodiments, and the detailed description thereof is omitted for brevity.

The procedure of making photographic prints according to the embodiment shown in Figs.12 to 15 will be described with reference to the flow chart of Fig.16.

First, multi-points distance measurement is performed by the camera, and the selection circuit 83 determines the position of the primary subject based on the distance measurement values. Thereafter, brightness measurement is performed with respect to the brightness measurement areas which contains the primary subject, and an exposure is performed under the exposure control which is based on the brightness measurement values. Furthermore, the primary area data, that is, the position data of the primary subject, is recorded as a bar code on the photosensitive emulsion surface of the photographic film in association with the corresponding original frame.

After completing the exposure, the photographic film 37 is subjected to developing and printing in a photofinishing laboratory. In printing, a bar code reader 65 reads the bar code 38 recorded on the photographic film 37, and a decoder 66 converts the bar code signal into primary area data and sends the same to a controller 67 of the photographic printer. A scanner 72 measures the pixels of the original frames set in a printing position in the three color separation method. A characteristic value deriver 73 derives a density of the original image of the primary subject based on the primary area data and the photometric values of the respective pixels. An exposure calculator 95 calculates an exposure correction amount based on the density of the primary subject, and calculates a proper print exposure amount by adding the exposure correction amount to a basic print exposure amount which is predetermined on the premise that the original frame is taken under a proper exposure value of the camera side. The controller 67 calculates an exposure time based on the calculated proper print exposure amount, and controls the shutter driver 60 corresponding to the exposure time. It is to be noted that it is possible to predetermine a basic exposure time corresponding to the basic print exposure amount, and add a correction time determined based on the exposure correction amount to the basic exposure time, so as to determine a proper print exposure time.

The exposure correction amount is calculated as follows. First, the position of the primary subject in the original frame 37b is determined based on the primary area data, and the density distribution of the image within the area that contains the primary subject is detected, so as to distinguish the primary subject from the background. With reference to the density distribution of the primary subject and the background, the density of the primary subject is derived. And the exposure correction amount for the basic print exposure amount is determined based on the primary subject density, so as to make the print density of the primary subject optimum in the photographic print.

Although the just-described embodiment uses data of the divisional brightness measurement areas in which the primary subject is present, as the photographic data to be taken into consideration in determining the print exposure amount, it is possible to use the brightness measurement values of the respective brightness measurement areas, aperture size data, shutter speed data, object distance data, camera magnification data and/or other photographic data in combination with the primary area data. The brightness measurement values of the respective brightness measurement areas, the aperture size and the shutter speed are useful for determining the basic exposure amount, so that it becomes possible to control the print exposure amount more precisely. The object distance and the camera magnification are useful for estimating

the primary subject in the original frame.

Because there is difference in exposure control function between the camera type, it is possible to record the camera type as the photographic data on the photographic film, in order to change the basic print exposure amount according to the camera type.

Although the photographic data including the discrimination data and the primary area data are optically recorded on the photosensitive emulsion surface of the photographic film in the form of bar code in the above described embodiments, it is possible to record these photographic data magnetically on a magnetic recording layer formed on the photographic film. The magnetic recording layer may be formed in an area outside the image recording portion of the photographic film, or may be made of a transparent magnetic substance and applied over the entire surface of one side of the photographic film opposite the photosensitive emulsion surface. It is preferable to use transparent magnetic base materials for the magnetic recording layer made of transparent magnetic substance, which are known from U.S.P. Nos. 4,302,523; 3,782,947 and 5,279,945.

It is also possible to record the photographic data electrically in an electric memory medium, such as a memory chip incorporated in a film cartridge, a memory card attached to a camera, or the like.

While the present invention has been described in detail above with reference to a preferred embodiment shown in the drawings, it will be apparent to those skilled in the art that various changes and modifications of the present invention are possible with the scope of the following claims.

Claims

1. A method of making photographic print from original frames (37b) recorded on a photographic film (37), each of said original frame having an image of a scene (10) consisting of a primary subject (16) and a background, said method comprising the steps of:

   recording discrimination data (38) for designating either a first or a second printing method on a recording medium in association with said each original frame when said each original frame is formed by photographing said scene by a camera;

   reading said discrimination data when printing said original frame; and

   selecting either said first or said second printing method based on said discrimination data, for printing said each original frame onto a photographic paper at a print exposure amount which is determined by using said selected first or second printing method, said first printing method calculating said print exposure amount on the basis of image density data obtained by measuring said original frame, and said second printing method calculating said print exposure amount by correcting a predetermined print exposure amount according to the type of said photographic film.

2. A method of making photographic prints as recited in claim 1, wherein said discrimination data is recorded for said original frame when said original frame is photographed under a photographic condition for which the camera can photograph said original frame at a proper exposure value based on said primary subject, and wherein said second printing method is selected when said discrimination data is detected.

3. A method of making photographic prints as recited in claim 1, wherein said discrimination data is recorded for said original frame when said original frame is photographed under such a photographic condition for which the precision of the exposure control of the camera becomes low, and wherein said first printing method is selected when said discrimination data is detected.

4. A method of making photographic prints as recited in claim 3, wherein said discrimination data is recorded for said original frames when said original frame is photographed under a photographic condition for which the camera judges that the exposure control system of the camera cannot deal with an exposure value which is determined in an exposure determining section by measuring light values of said scene.

5. A method of making photographic prints as recited in claim 4, wherein said discrimination data is recorded for said original frame when said original frame is photographed under a photographic condition wherein lack or excess of flash light may arises.

6. A method of making photographic prints as recited in claim 4, wherein said second kind discrimination data is recorded for a said original frame which is photographed under a photographic condition wherein a proper brightness measurement is difficult because the size of brightness measuring elements of the camera is larger than the facial area of an image of said primary subject focused on a brightness measurement device.

7. A method of making photographic prints as recited in claim 1, wherein there are two kinds of said discrimination data, the first kind discrimination data being recorded for a said original frame which is photographed under a photographic condition wherein the precision of the exposure control of the camera becomes low, and the second kind discrimination data being recorded for a said original frame which is photographed under a photographic condition for which the camera can photograph at a proper exposure value based on said primary subject, and wherein said first printing method is selected when said first kind discrimination data is detected, and said second printing method is selected when said second kind discrimination data is detected.

8. A method of making photographic prints from original frames recorded on a photographic film, each of said original frame having an image of a scene consisting of a primary subject and a background, said method comprising the steps of:

recording photographic data representing photographic conditions in association with said original frame when said original frame is formed by photographing said scene by a camera;

reading said photographic data when printing;

judging based on said photographic data whether said original frame is photographed by a camera under a proper photographic condition which is based on said primary subject, or is photographed by a camera of which the precision of the exposure control is low;

selecting a first printing method when said original frame is improperly exposed, or a second printing method when said original frame is photographed under the proper photographic condition, wherein said first printing method calculates a print exposure amount on the basis of image density data obtained by measuring said original frame, and said second printing method calculates a print exposure amount by correcting a predetermined print exposure amount according the type of said photographic film.

9. A method of making photographic prints as recited in claim 1, wherein said recording medium for recording said photographic data is said photographic film on which said frame is photographed.

10. A method of making photographic prints from original frames recorded on a photographic film, said method comprising the steps of:

forming said original frame by photographing a scene containing a primary subject by means of a camera, said camera having a focus-lock function for measuring a distance of said primary subject while framing said scene such that said primary subject is disposed in a center of a viewfinder, a divided brightness measurement function for measuring brightness values in a plurality of divisional areas of said scene at the time of focus-locking, an automatic exposure control function for controlling exposure for photographing said scene on said photographic film based on brightness data obtained by said brightness measurement, and a data recording function for recording photographic data in a recording medium; and

controlling print exposure for making said photographic print from said original frame in a photographic printer, by determining a print exposure amount based on a constant basic print exposure amount which is independent of the image density of said original frame to be printed and a correction amount for correcting said basic print exposure amount, said basic print exposure amount being a value necessary for printing a standard original frame recorded on a standard photographic film onto a photographic paper in an optimum condition, and said correction amount being determined based on said photographic data.

11. A method of making photographic prints as recited in claim 10, wherein said exposure control for photographing said scene is performed while putting emphasis on the brightness values measured in a central area of said scene.

12. A method of making photographic prints as recited in claim 11, wherein said photographic data includes said brightness values measured in said plurality of divisional areas, brightness data of the central area of said scene and brightness data of a peripheral area of said scene, said central area brightness data and said peripheral area brightness data being derived from said brightness values of said divisional areas, and said correction amount is calculated according to an equation which is determined for each of a plurality of ranges defined in a two-dimensional coordinate representing said central area brightness data and said peripheral area brightness data as parameters thereof, said equation containing said brightness values of said divisional areas.

13. A method of making photographic prints as recited in claim 11, wherein said photographic data includes said brightness values measured in said plurality of divisional areas, brightness data of the central area or a peripheral area of said scene, and camera magnification data, said central area brightness data or said peripheral area brightness data being derived from said brightness values of said divisional areas, and said correction amount is calculated according to an equation which is determined for each of a plurality of ranges defined in a two-dimensional coordinate representing said central area brightness data or said peripheral area brightness data and said camera magnification data as parameters thereof, by using these parameters for the calculation.

14. A method of making photographic prints as recited in claim 11, wherein said photographic data includes said brightness values measured in said plurality of divisional areas, brightness difference data between the central area and a peripheral area of said scene, and camera magnification data, and said correction amount is calculated according to an equation which is determined for each of a plurality of ranges defined in a two-dimensional coordinate representing said brightness difference data and said camera magnification data as parameters thereof, by using said parameters for the calculation.

15. A method of making photographic prints as recited in claim 11, wherein said photographic data includes said brightness values measured in said plurality of divisional areas, brightness data of the central area of said scene, brightness data of a peripheral area of said scene, and camera magnification data, said central area brightness data and said peripheral area brightness data being derived from said brightness values of said divisional areas, and said correction amount is calculated according to an equation which is determined for each of a plurality of ranges defined in a three-dimensional coordinate representing said central area brightness data, said peripheral area brightness data and said camera magnification as parameters thereof, by using these parameters for the calculation.

16. A method of making photographic prints as recited in claim 11, wherein said recording medium is said photographic film.

17. A method of making photographic prints from original frames, comprising the steps of:

forming said original frame by photographing a scene containing a primary subject by means of a camera, said camera having a multi-autofocusing function by which distance measurement of said scene is performed at a plurality of measurement points, and said primary subject is discriminated based on distance measurement data of said measurement points, for focusing a taking lens, a divided brightness measurement function by which said scene is divided into a plurality of areas correspondingly to said measurement points, for measuring brightness values in said divided brightness measurement areas, an automatic exposure control function for controlling exposure on photographing while putting emphasis on the brightness value of at least one of said divided brightness measurement areas which corresponds to at least one of said measurement points at which said primary subject is detected, and data recording function for recording position data representing a position of said primary subject within said original frame in a recording medium;

reading said position data of said primary subject on printing;

controlling print exposure for making said photographic print from said original frame by determining a print exposure amount based on a constant basic print exposure amount which is independent of image density of said original frame to be printed, and a correction amount for correcting said basic print exposure amount, said basic print exposure amount being a value necessary for printing a standard image recorded on a standard photographic film onto a photographic paper in an optimum condition, and said correction amount being calculated based on density data of an image of said primary subject which is detected from said original frame with reference to said position data of said primary subject.

18. A method of making photographic prints as recited in claim 17, wherein said camera further includes a viewfinder (86) having a liquid crystal display panel (87), said liquid crystal display panel having a plurality of finder areas which correspond to said plurality of brightness measurement areas, and displaying at least one of said finder areas which contains said discriminated primary subject, distinctively from other finder areas.

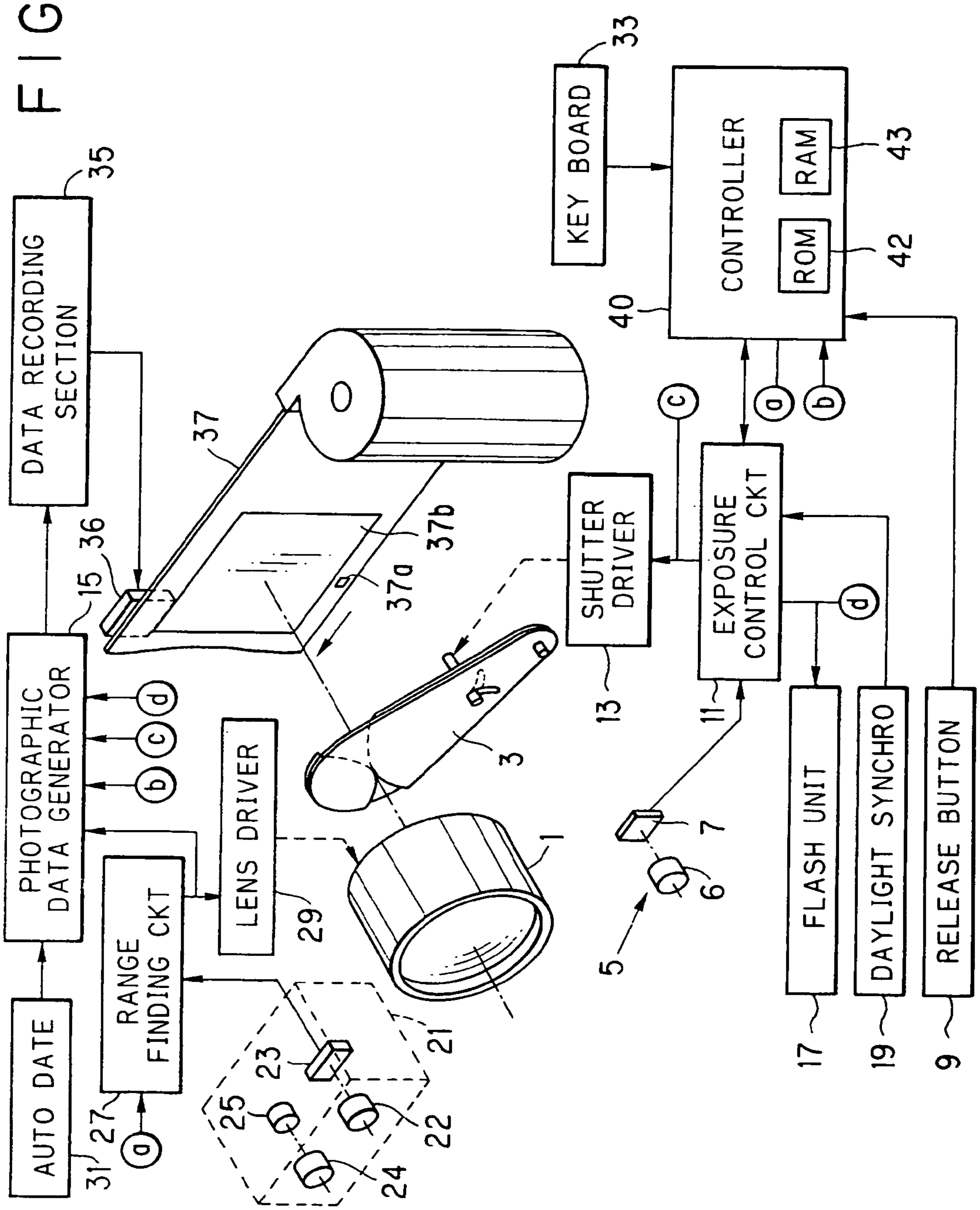
19. A method of making photographic prints as recited in claim 18, wherein said camera further includes a primary area selecting function (89) by which, when said multi-autofocus func-

tion detects a plurality of objects, said objects are sequentially indicated by distinctively displaying at least one of said finder areas which corresponds to each of said objects, in an order from the object for which the probability of being said primary subject is highest, so as to select said primary subject among from said objects.

20. A method of making photographic prints as recited in claim 19, wherein said at least one finder area corresponding to each of said objects is displayed distinctively from other finder areas in an intermittent fashion.

21. A method of making photographic prints as recited in claim 20, wherein said recording medium is said photographic film.

FIG. 1



DATA RECORDING SECTION
35
36
15
37
37a
37b
PHOTOGRAPHIC DATA GENERATOR
b
c
d
AUTO DATE
31
RANGE FINDING CKT
27
a
LENS DRIVER
29
21
22
23
24
25
1
3
5
6
7
SHUTTER DRIVER
13
EXPOSURE CONTROL CKT
11
KEY BOARD
33
CONTROLLER
ROM
RAM
40
42
43
FLASH UNIT
17
DAYLIGHT SYNCHRO
19
RELEASE BUTTON
9

FIG. 2

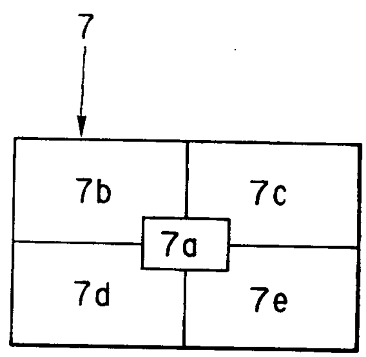


FIG. 3

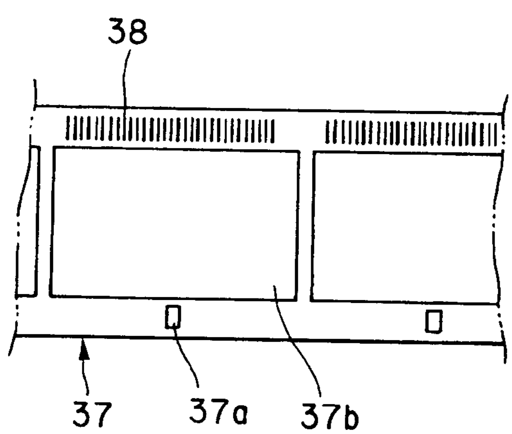


FIG. 4

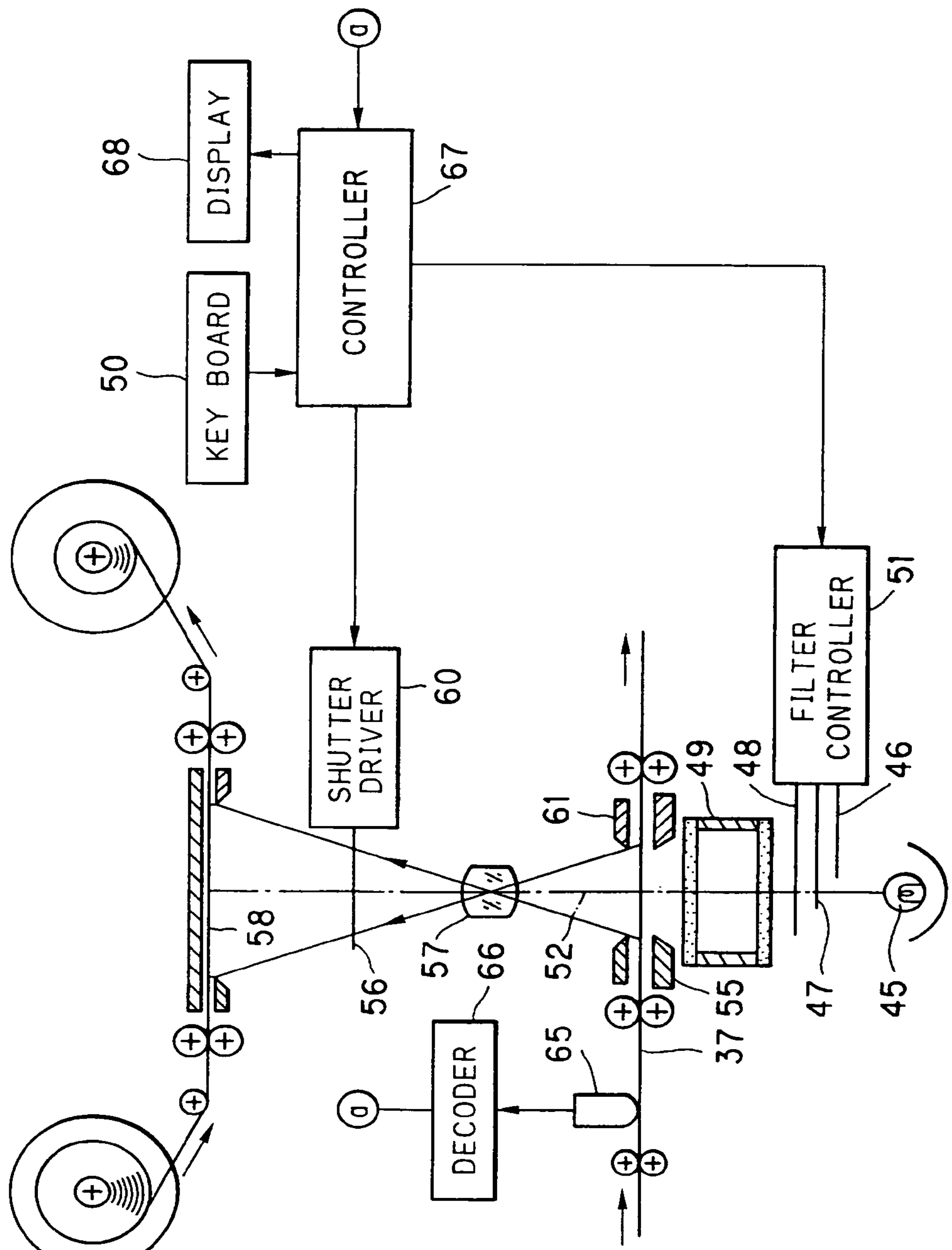
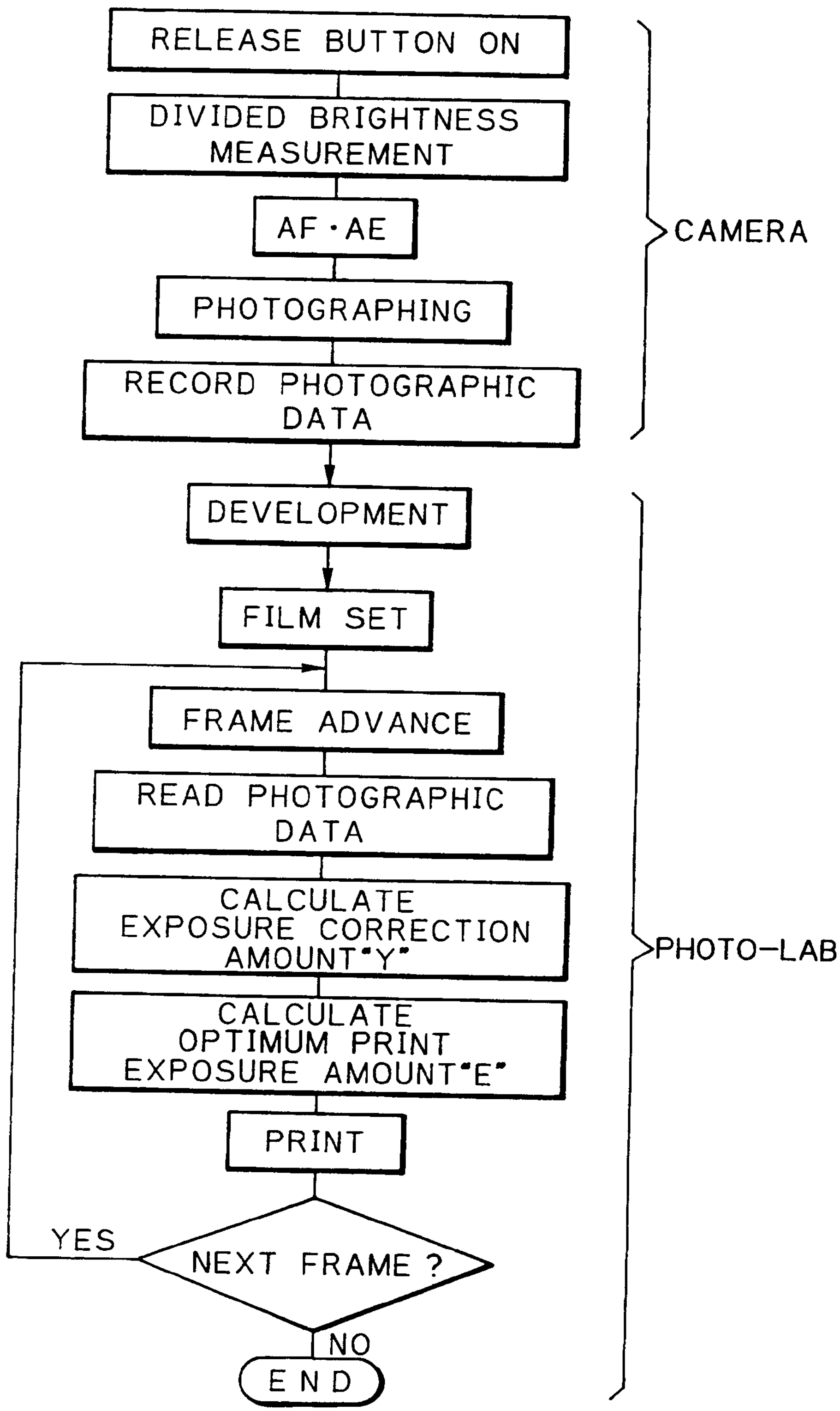

68
DISPLAY
50
KEY BOARD
CONTROLLER
67
a
SHUTTER DRIVER
60
FILTER CONTROLLER
51
49
48
46
61
58
57
56
66
52
DECODER
65
37
55
47
45
m

FIG. 5


RELEASE BUTTON ON
DIVIDED BRIGHTNESS MEASUREMENT
AF・AE
PHOTOGRAPHING
RECORD PHOTOGRAPHIC DATA
CAMERA
DEVELOPMENT
FILM SET
FRAME ADVANCE
READ PHOTOGRAPHIC DATA
CALCULATE EXPOSURE CORRECTION AMOUNT "Y"
CALCULATE OPTIMUM PRINT EXPOSURE AMOUNT "E"
PRINT
NEXT FRAME ?
YES
NO
END
PHOTO-LAB

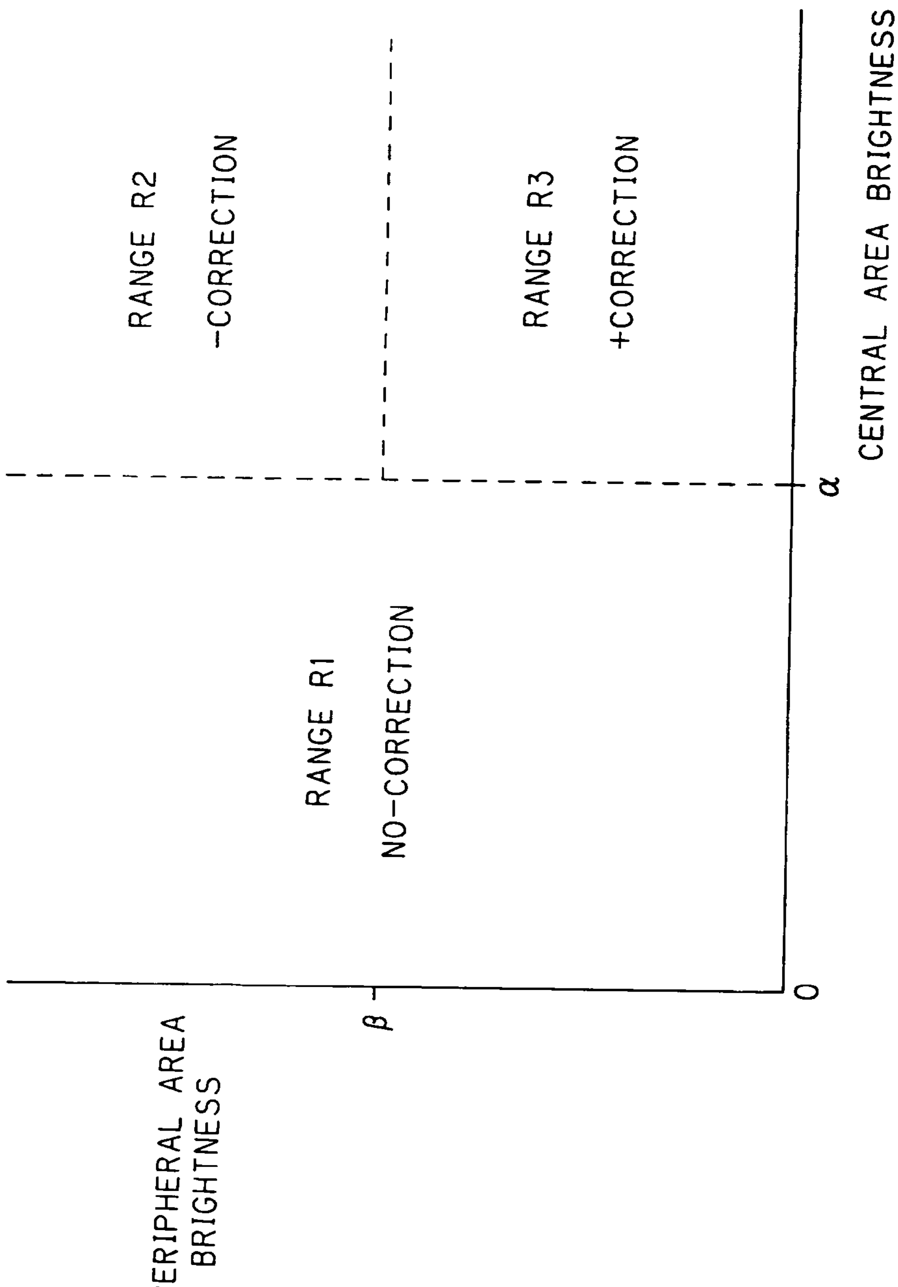

RANGE R2
-CORRECTION
RANGE R3
+CORRECTION
CENTRAL AREA BRIGHTNESS
RANGE R1
NO-CORRECTION
α
0
β
PERIPHERAL AREA BRIGHTNESS

FIG. 6

FIG. 7

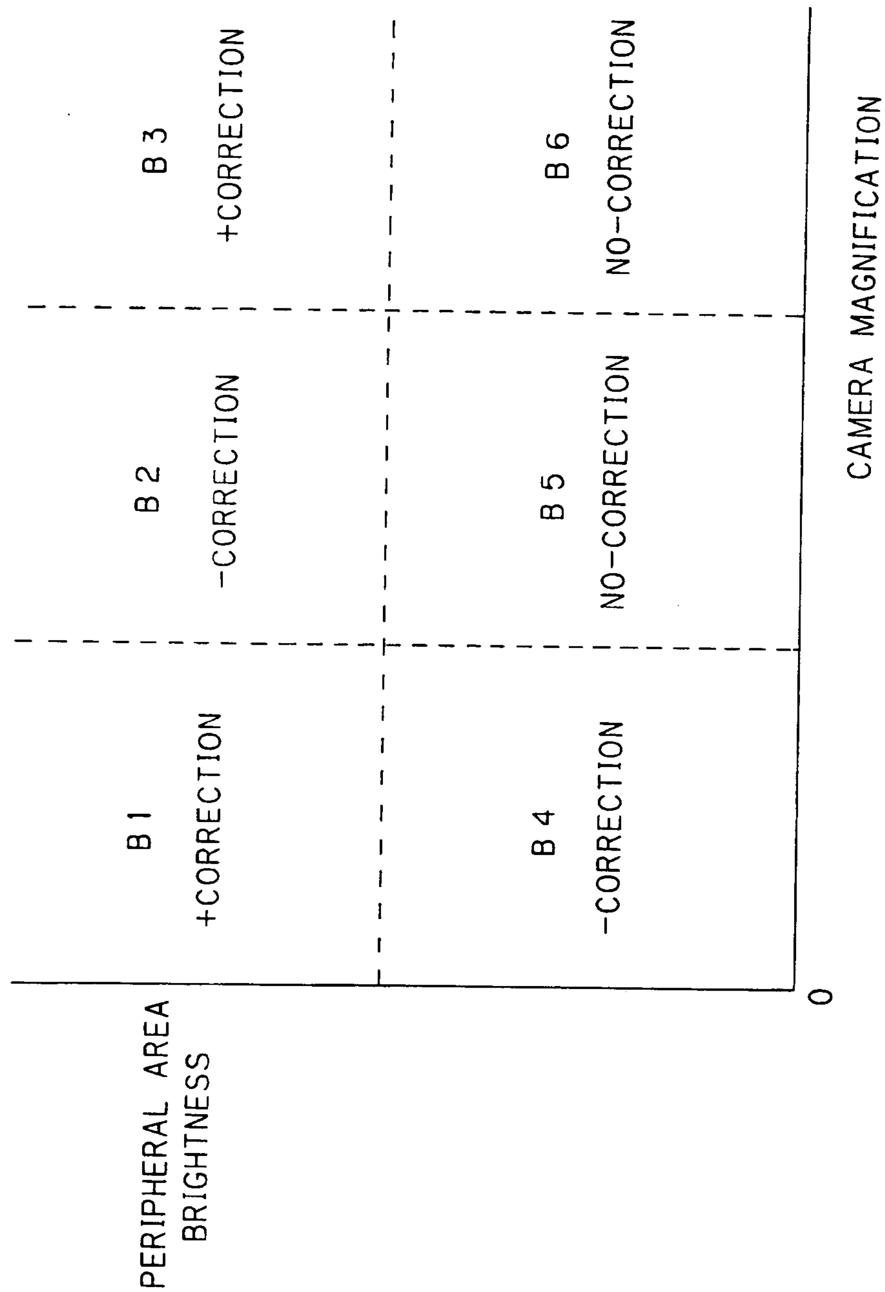
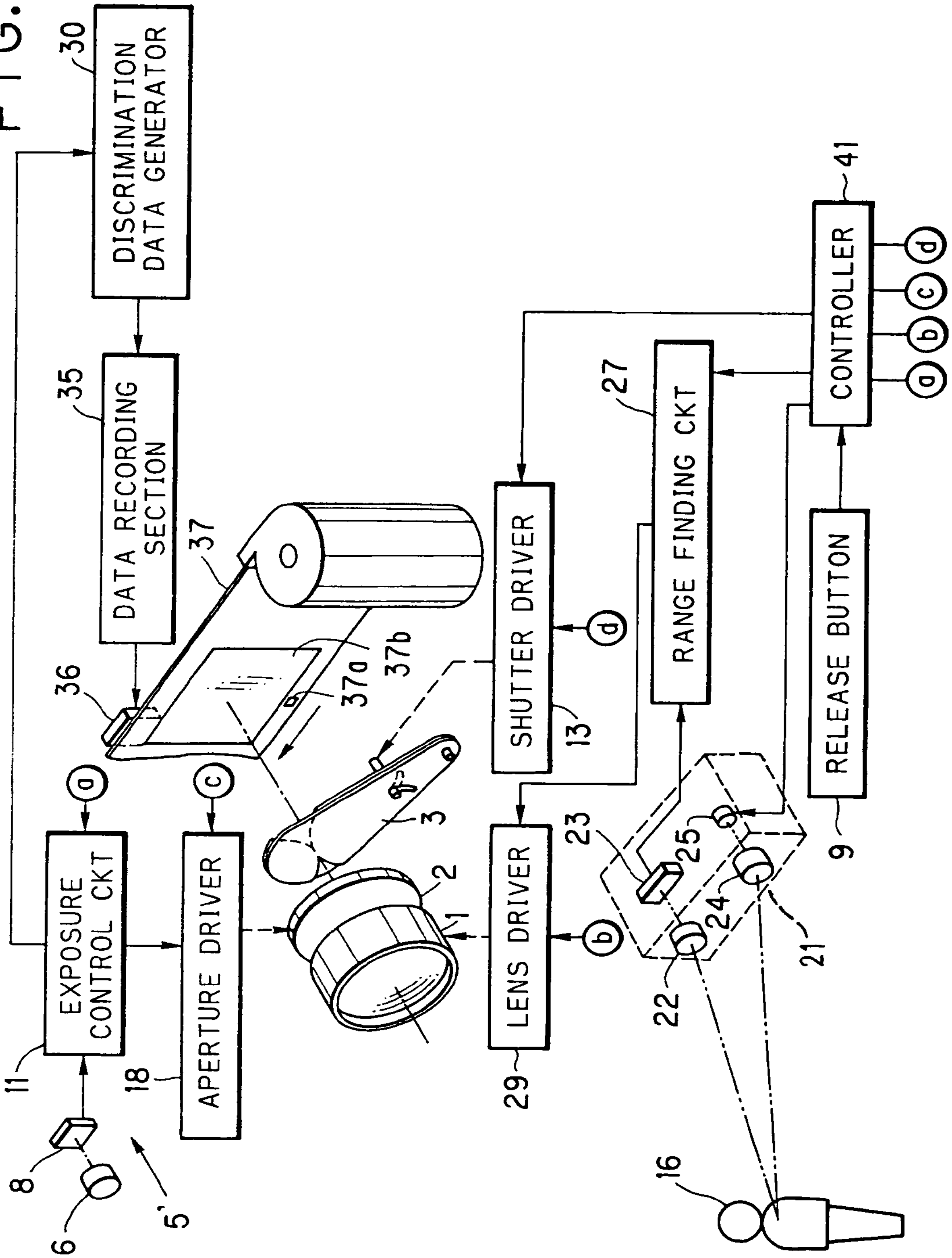
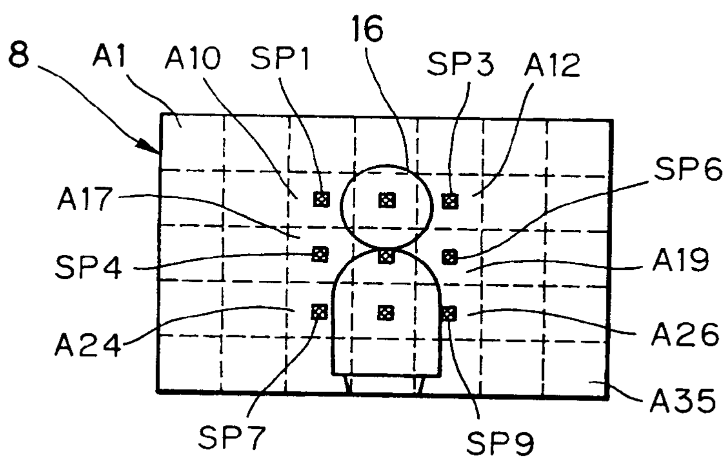

PERIPHERAL AREA BRIGHTNESS
B 1
+CORRECTION
B 2
-CORRECTION
B 3
+CORRECTION
B 4
-CORRECTION
B 5
NO-CORRECTION
B 6
NO-CORRECTION
0
CAMERA MAGNIFICATION

FIG. 8


DISCRIMINATION DATA GENERATOR
30
DATA RECORDING SECTION
35
36
37
37a
37b
SHUTTER DRIVER
13
d
RANGE FINDING CKT
27
CONTROLLER
41
a
b
c
d
RELEASE BUTTON
9
EXPOSURE CONTROL CKT
11
a
APERTURE DRIVER
18
c
3
2
1
LENS DRIVER
29
b
23
25
24
22
21
16
8
6
5'

F I G. 9



▩ ···BRIGHTNESS MEASUREMENT SPOT

FIG. 10

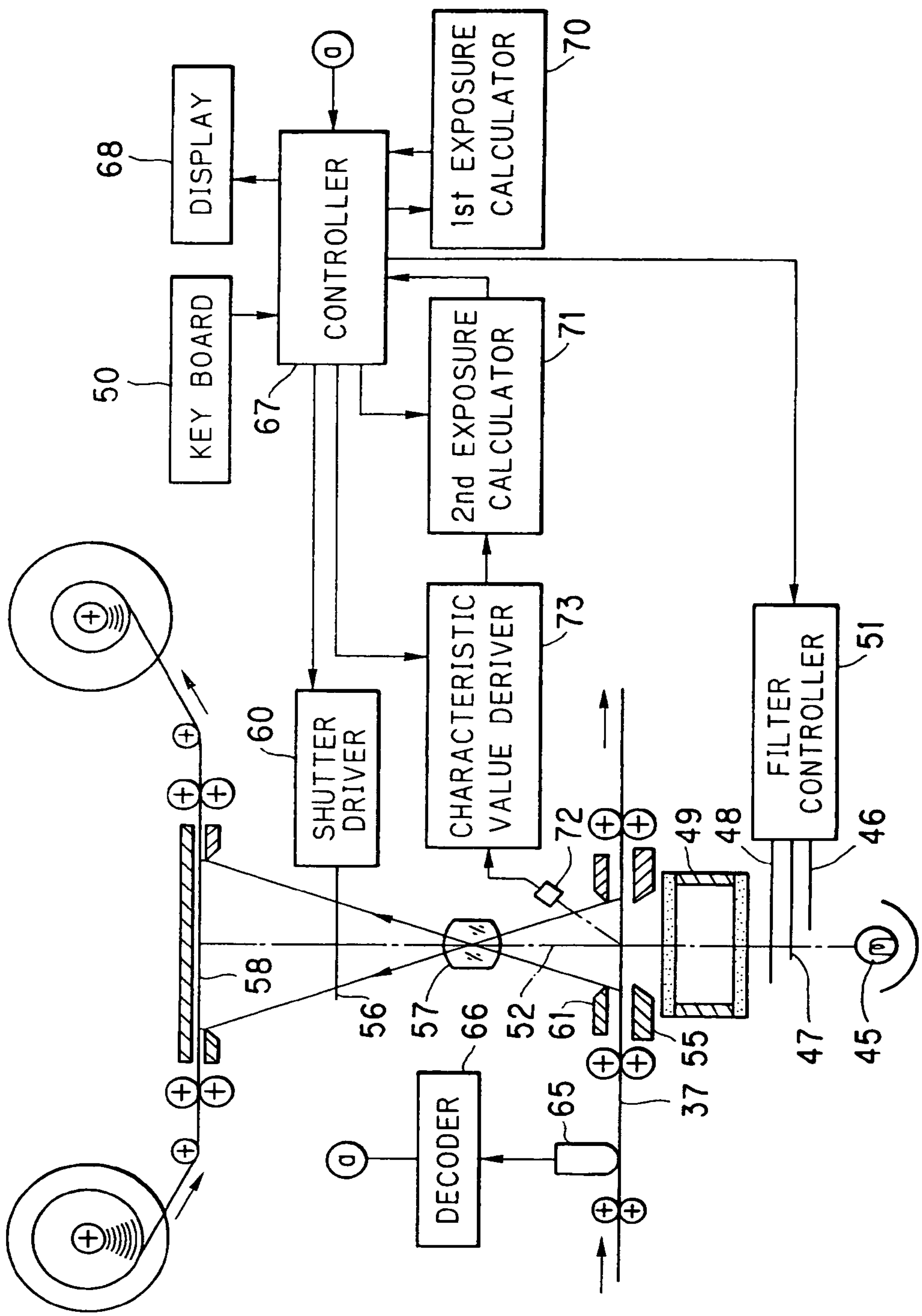

DISPLAY
68
KEY BOARD
50
CONTROLLER
67
1st EXPOSURE CALCULATOR
70
2nd EXPOSURE CALCULATOR
71
CHARACTERISTIC VALUE DERIVER
73
SHUTTER DRIVER
60
FILTER CONTROLLER
51
DECODER
66
65
a
a
72
49
48
46
47
45
58
56
57
52
61
55
55
37

FIG. 11

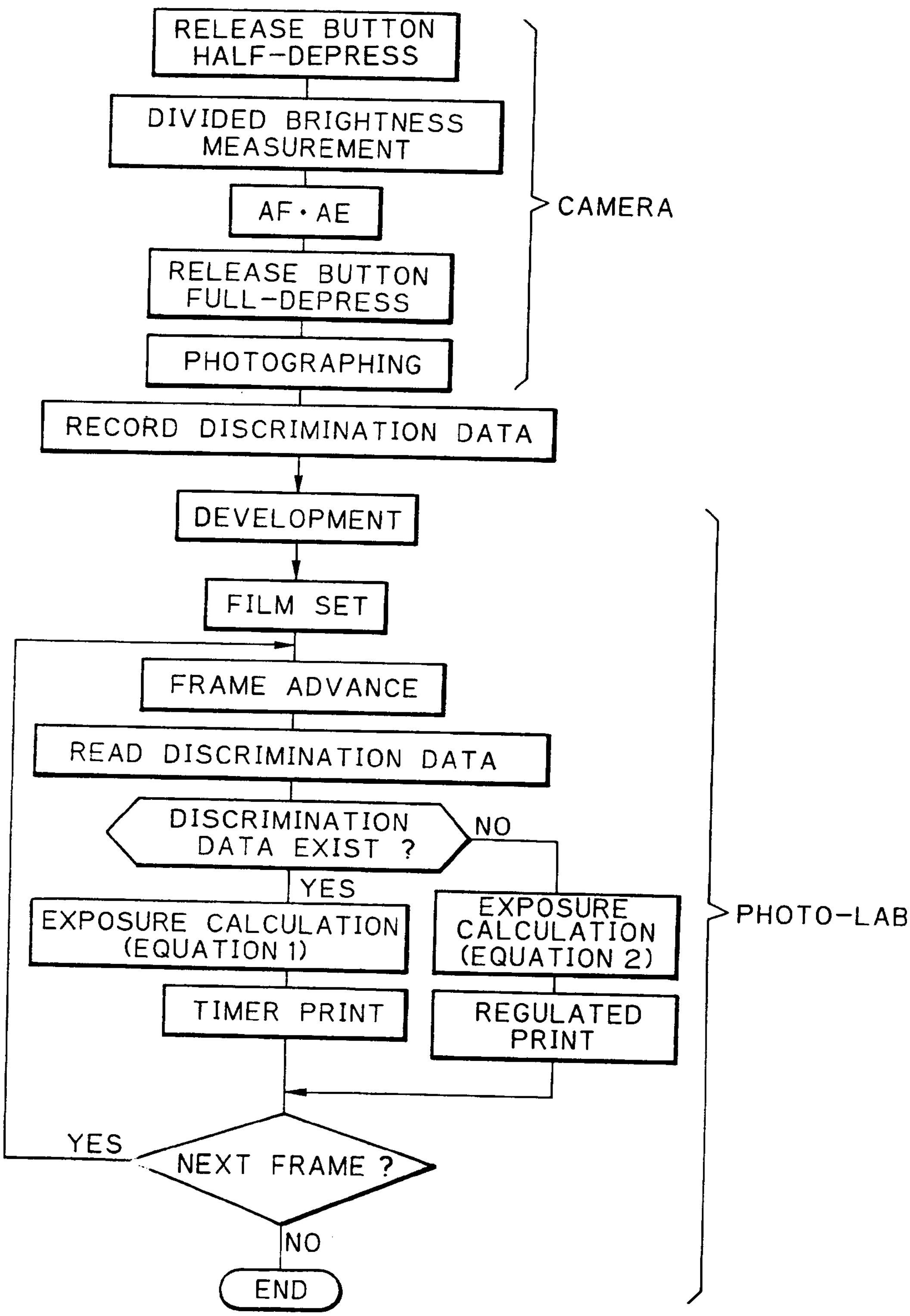
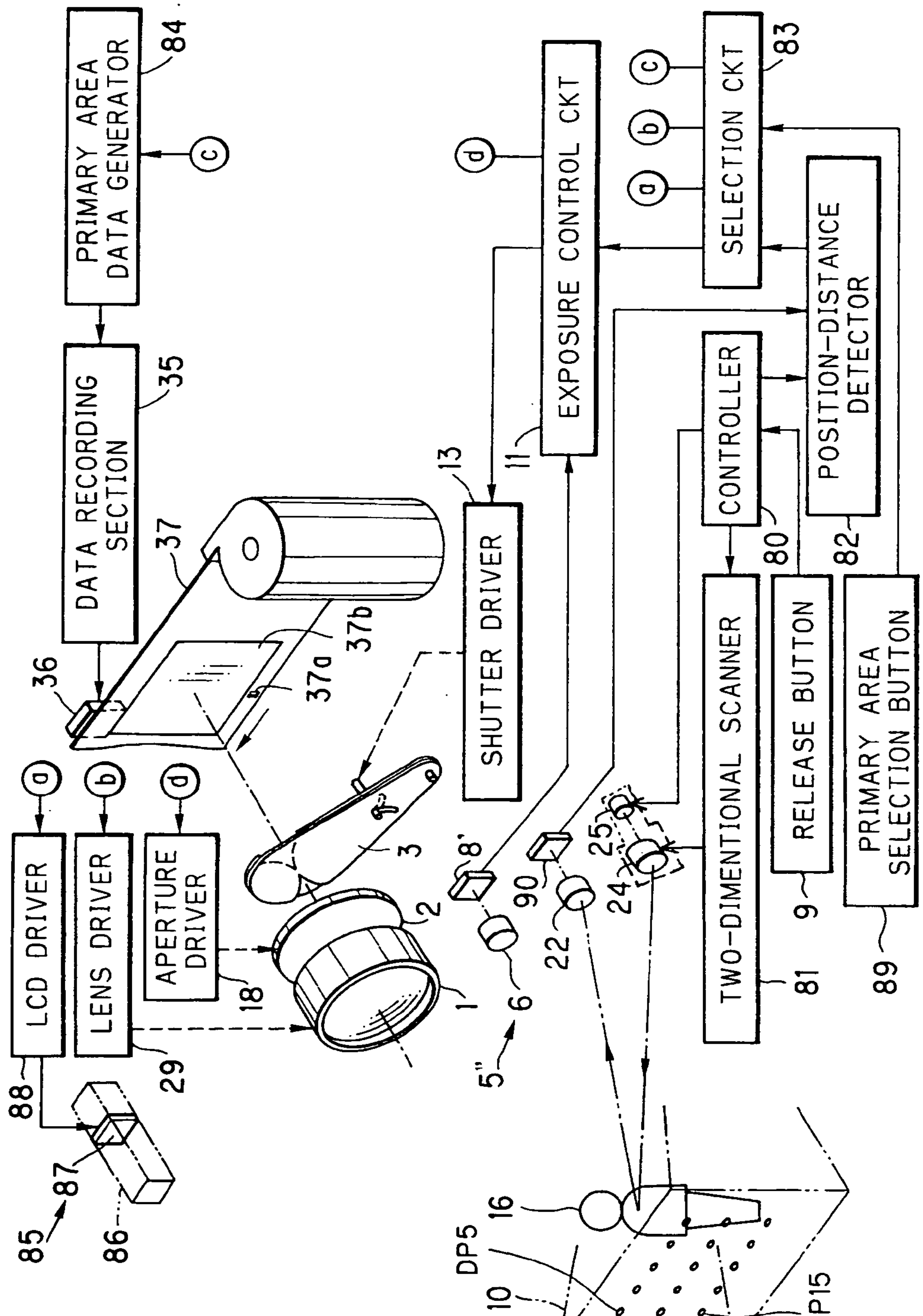
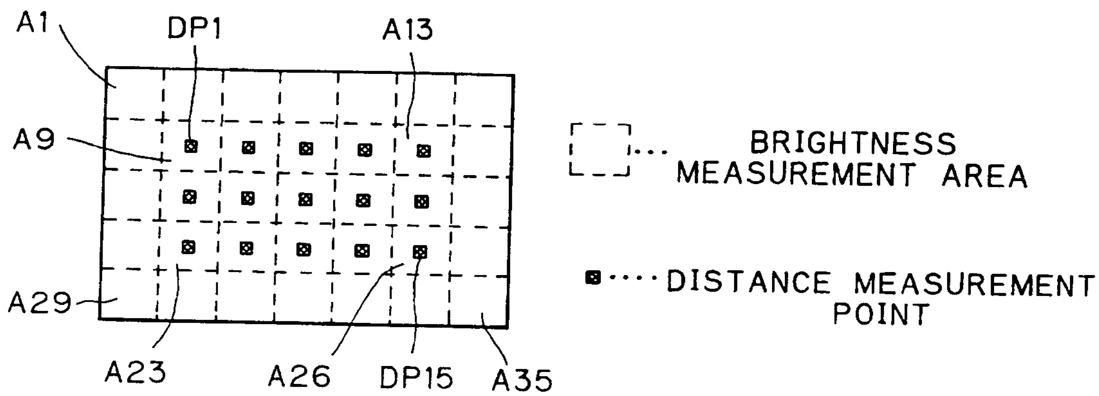

RELEASE BUTTON HALF-DEPRESS
DIVIDED BRIGHTNESS MEASUREMENT
AF・AE
RELEASE BUTTON FULL-DEPRESS
PHOTOGRAPHING
CAMERA
RECORD DISCRIMINATION DATA
DEVELOPMENT
FILM SET
FRAME ADVANCE
READ DISCRIMINATION DATA
DISCRIMINATION DATA EXIST ?
NO
YES
EXPOSURE CALCULATION (EQUATION 1)
EXPOSURE CALCULATION (EQUATION 2)
TIMER PRINT
REGULATED PRINT
PHOTO-LAB
YES
NEXT FRAME ?
NO
END

FIG. 12


PRIMARY AREA DATA GENERATOR
84
DATA RECORDING SECTION
35
EXPOSURE CONTROL CKT
11
SELECTION CKT
83
POSITION-DISTANCE DETECTOR
82
CONTROLLER
80
SHUTTER DRIVER
13
TWO-DIMENTIONAL SCANNER
81
RELEASE BUTTON
9
PRIMARY AREA SELECTION BUTTON
89
LCD DRIVER
88
LENS DRIVER
29
APERTURE DRIVER
18
a
b
c
d
36
37
37a
37b
3
2
1
8'
6
5"
90
22
24
25
85
86
87
16
DP5
DP15
10

F I G. 13


A1
DP1
A13
A9
A29
A23
A26
DP15
A35
BRIGHTNESS MEASUREMENT AREA
DISTANCE MEASUREMENT POINT

F I G. 14

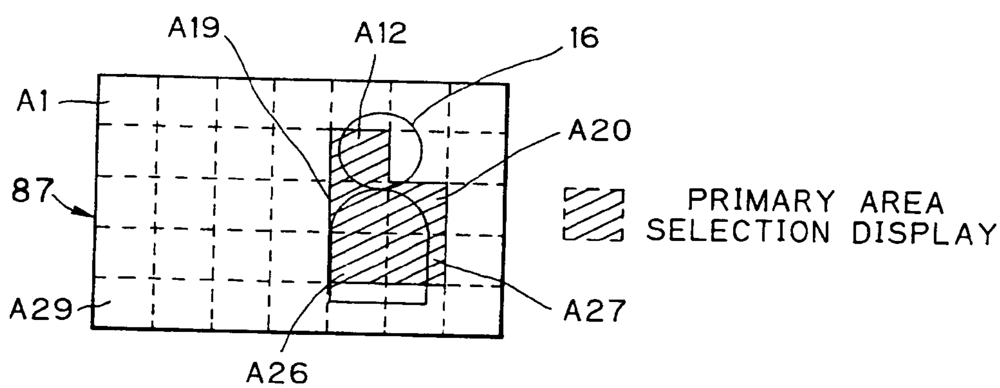
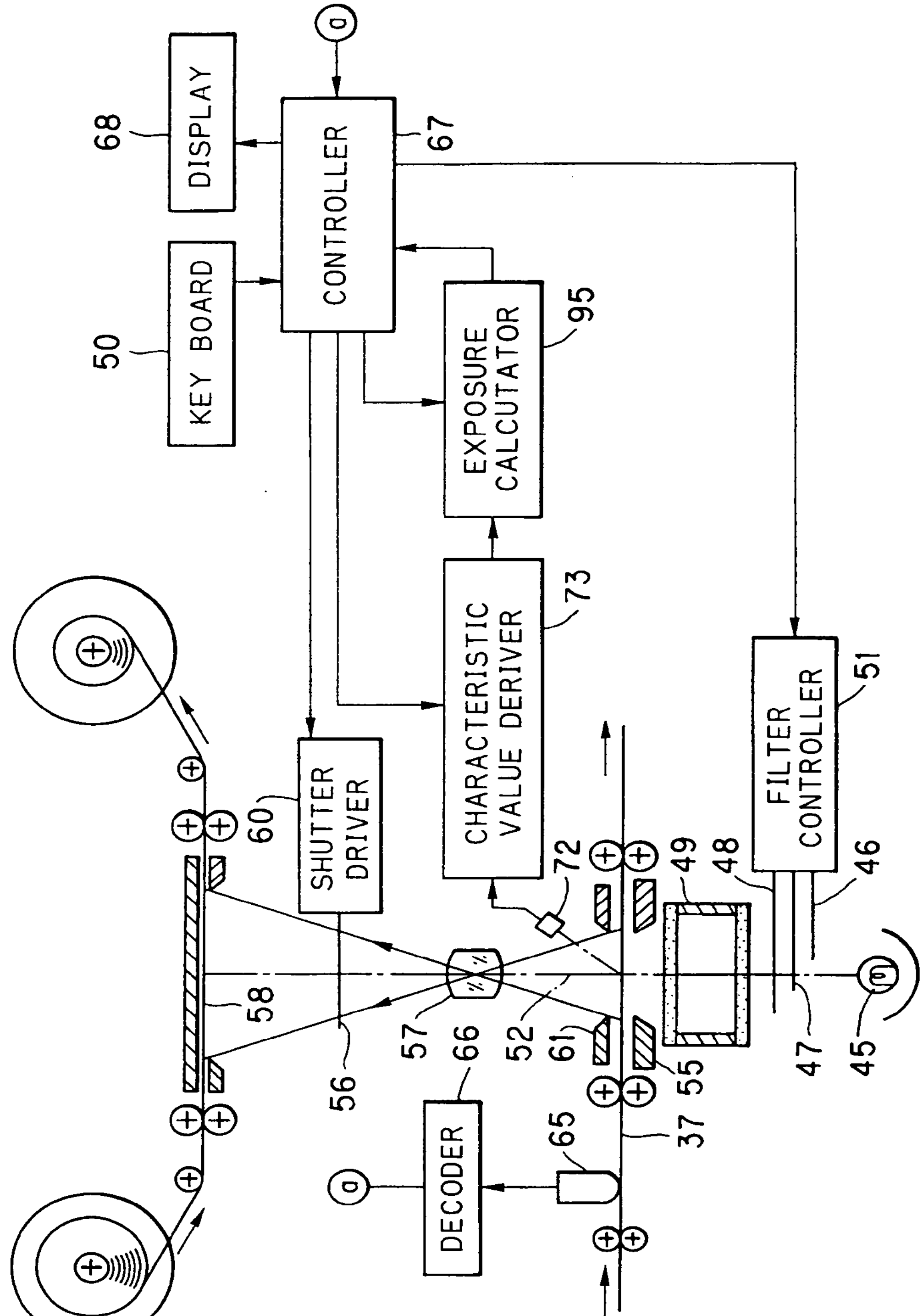
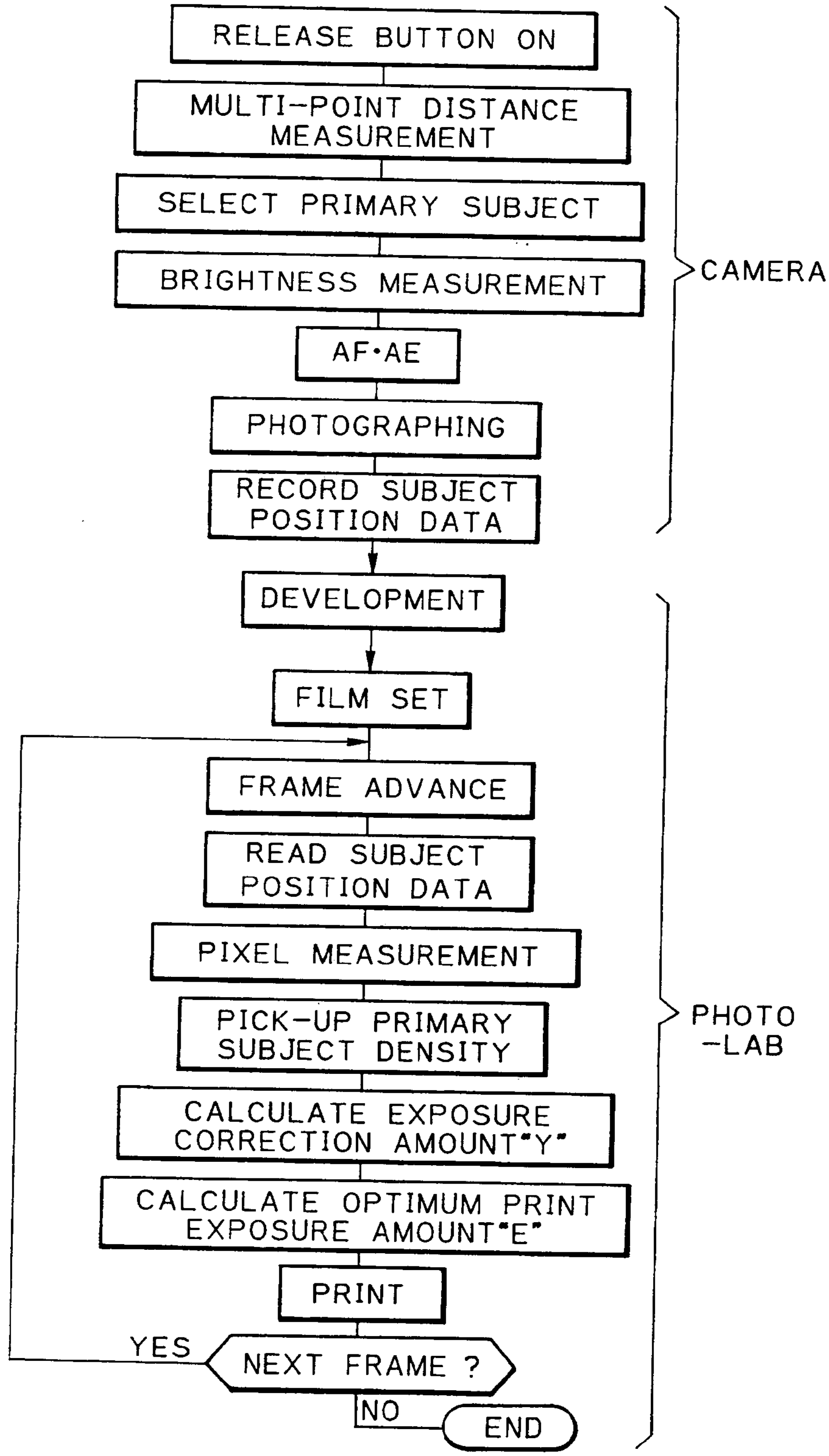

A19
A12
16
A1
A20
87
A29
A27
A26
PRIMARY AREA SELECTION DISPLAY

FIG. 15


KEY BOARD
DISPLAY
CONTROLLER
EXPOSURE CALCULATOR
CHARACTERISTIC VALUE DERIVER
SHUTTER DRIVER
FILTER CONTROLLER
DECODER
a
50
68
67
95
73
60
51
72
49
48
46
58
57
66
52
61
55
56
37
65
47
45

F I G. 16


RELEASE BUTTON ON
MULTI–POINT DISTANCE MEASUREMENT
SELECT PRIMARY SUBJECT
BRIGHTNESS MEASUREMENT
AF•AE
PHOTOGRAPHING
RECORD SUBJECT POSITION DATA
CAMERA
DEVELOPMENT
FILM SET
FRAME ADVANCE
READ SUBJECT POSITION DATA
PIXEL MEASUREMENT
PICK–UP PRIMARY SUBJECT DENSITY
CALCULATE EXPOSURE CORRECTION AMOUNT "Y"
CALCULATE OPTIMUM PRINT EXPOSURE AMOUNT "E"
PRINT
NEXT FRAME ?
YES
NO
END
PHOTO –LAB

(19) Europäisches Patentamt
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Office européen des brevets

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(71) Applicant: **FUJI PHOTO FILM CO., LTD.**
210 Nakanuma
Minami Ashigara-shi
Kanagawa 250-01(JP)

(72) Inventor: **Terashita, Takaaki, c/o Fuji Photo Film Co., Ltd.**
798, Miyanodai,
Kaisei-machi
Ashigara-kami-gun, Kanagawa(JP)
Inventor: **Kinjo, Naoto, c/o Fuji Photo Film Co., Ltd.**
798, Miyanodai,
Kaisei-machi
Ashigara-kami-gun, Kanagawa(JP)
Inventor: **Kanafusa, Kunihiko, c/o Fuji Photo Film Co., Ltd.**
210 Nakanuma
Minami Ashigara-shi, Kanagawa(JP)
Inventor: **Ikenoue, Shinpei, c/o Fuji Photo Film Co., Ltd.**
210 Nakanuma
Minami Ashigara-shi, Kanagawa(JP)

(74) Representative: **Patentanwälte Grünecker, Kinkeldey, Stockmair & Partner**
Maximilianstrasse 58
D-80538 München (DE)

(54) Method of making photographic prints.

(57) A method of making photographic prints wherein photographic data relating to photographic conditions of an original frame is recorded on a photographic print at the time of photographing the original frame, so as to determine the print exposure amount for printing the original frame. When it is determined with reference to the photographic data that a primary subject of the original frame has a proper density on the photographic film, the original frame is printed at a basic print exposure amount which is determined without using density data of the original frame. If it is determined with reference to the photographic data that the basic print exposure amount should be corrected for the original frame, an exposure correction amount is calculated based on the photographic data and/or the density data of the original frame. The photographic data is, for example, discrimination data for indicating whether the original frame has been photographed under a proper exposure control, or brightness values measured in a plurality of divisional areas. The photographic data may also be primary subject position data for deriving the density of the primary subject from the density data of the original frame.

EP 0 532 047 A3

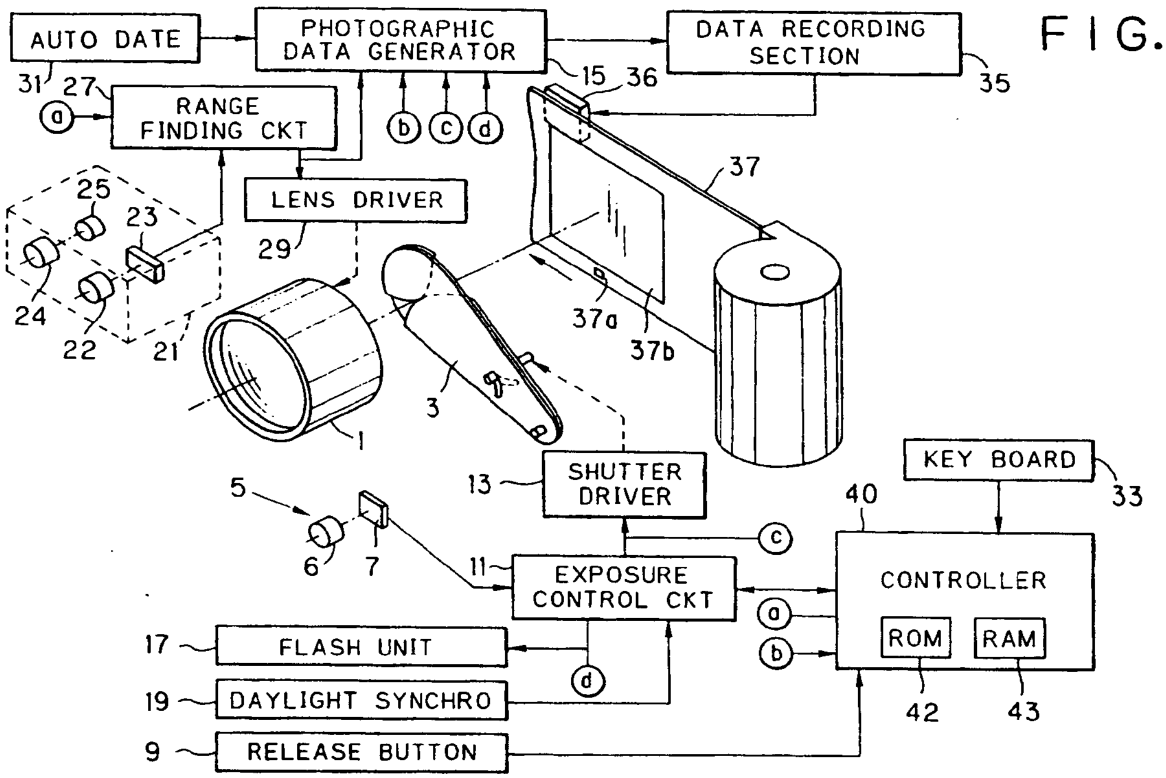
AUTO DATE
31
PHOTOGRAPHIC DATA GENERATOR
15
DATA RECORDING SECTION
35
36
27
a
RANGE FINDING CKT
b
c
d
37
LENS DRIVER
29
25
23
24
22
21
37a
37b
3
1
SHUTTER DRIVER
13
KEY BOARD
33
40
5
6
7
c
11
EXPOSURE CONTROL CKT
CONTROLLER
a
b
ROM
RAM
42
43
17
FLASH UNIT
d
19
DAYLIGHT SYNCHRO
9
RELEASE BUTTON

FIG. 1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92115616.2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	GB - A - 2 240 512 (KONICA) * Fig.; abstract; page 1, paragraphs 1,2; page 2, paragraph 1 *	1,2,10	G 03 B 7/091 G 03 B 27/80
A	* Totality *	8,9, 11, 16-19	
Y	GB - A - 2 176 677 (MITSUBISHI) * Fig. 1,4; abstract; page 1, lines 114-124 *	1,2,10	
A	* Totality *	8, 11-15, 17-19	
A	US - A - 4 969 005 (TOKUNAGA) * Fig.; abstract; column 2, line 49 - column 3, line 4 *	1-21	
A	DE - A - 3 620 525 (JEMCO) * Fig.; abstract; claims *	1-21	**TECHNICAL FIELDS SEARCHED (Int. Cl.5)** G 03 B 7/00 G 03 B 27/00 G 03 G 15/00 G 06 F 15/00 G 03 B 15/00 G 03 C 5/00 H 04 N 5/00
A	DE - A - 3 913 803 (CANON) * Fig.; abstract; claims *	1-8, 10-15, 17	
A	EP - A - 0 443 497 (NIKON) * Fig.; abstract; claims *	1, 7-12, 13-21	
A	EP - A - 0 246 010 (CROSFIELD ELECTRONICS) * Fig.; abstract; claims *	1, 10-12, 14,15, 17-19	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	28-03-1994	KRAL

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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